AMERICAN
JOURNAL OF SURGERY

VOL. XXXVII. DECEMBER, 1923 No. 12

CONGENITAL OCCLUSION OF THE SMALL INTESTINE.

ROBERT C. BRYAN, M.D., F.A.C.S.,
RICHMOND, VA.

Although several hundred cases of congenital intestinal occlusion have been reported, the condition is not common, as may be shown by the following statistics. In 1877 Theremin said that in 150,000 children at a Foundling Hospital in Petrograd there were only 9 cases recorded, 2 in 110,000 at a similar hospital in Vienna, and 2 among 41,000 at the Royal Lying-in Hospital at Copenhagen. Kuliga reported in 1903 a series of 189 cases, and Spriggs in 1912 added 24 unpublished cases. But these cases comprehend all occlusions and stenoses from the pylorus to the anus, whether the condition were pyloric stenosis, transduodenal bands, duodenal diverticula and cysts, jejunal and ileal atresia, incarcerated internal hernia, volvulus, intussusception, axial rotation, peritonitis, mesenteric deficiency, umbilical snaring, Meckel's diverticulum, imperforate rectum or anus and those instances of intestinal ulcer as reported by Thorel.

It is not my desire to consider the many intra-abdominal pathological states of a congenital origin which may produce ileus. All such states are truly surgical, several are well understood, (congenital hypertrophic pyloric stenosis, atresia of the rectum), and they are recognized early and cured by surgery, others are less well appreciated; and so it is with "intestinal atresia" of the new-born that I wish to concern myself particularly.

Leichtenstern found obstruction occurring 375 times at the ano-rectal junction, 75 times in the small intestine and 10 times in the colon, and the most common site of obstruction in the small intestine occurring at the duodenum, where occlusion is more frequent than stenosis. Sutton states that "congenital obstruction and narrowing of the alimentary canal always occur in a situation of embryological events". Since the liver arises as an outgrowth from the duodenum, he further concludes that atrophy of the duodenum is in some way associated with the development of the liver and pancreas.

That atresia occurs so frequently in the duodenum about the papilla of Vater is due to the developmental impulse in the liver and pancreas as quoted by Tandler, who in a series of 94 cases found that atresia of the duodenum constitutes 37.5% of all the cases of atresia in the small intestine. (Later estimates place the figure at 30%.) He then made exact measurements of the duodenum, ileum and jejunum, and found that by *taking into account the relative shortness of the duodenum* thirty-nine cases of congenital duodenal atresia occur to every one case of atresia in any other portion of the small intestine. The frequent location near Vater's papilla (noted in three-fourths of all the cases of duodenal atresia) can be attributed to the developmental impulse in the liver and pancreas, which becomes accelerated at this embryological epoch.

Howell, *St. Bartholomew's Hospital Reports*, 1905, says that there are three special places where occlusion can occur, (1) the duodenum above Vater's papilla, (2) the duodeno-jejunal juncture and (3) at the spot in the ileum where the omphalo-meseraic duct is given off. Hirschprung, from an analysis of 31 cases, gives 16 in the duodenum, 6 in the omphalo-meseraic duct, and 9 in positions between these two.

The exact location of intestinal atresia can be inferred, but not accurately predicted, and only by necropsy findings may the actual anatomical site be definitely established.

On October 21, 1923, Dr. J. Frasia Jones delivered a multipara, with four living children, at 6:40 P. M., after she had been in labor for ten hours. The position was L. O. A. and it was a normal birth. No instruments were used, but it was immediately noted that the infant's abdomen was considerably distended, being delivered with a little difficulty. There was no visible abnormality of the baby but the distended abdomen. The lubricated finger could be inserted in the rectum only a short distance; a small catheter was passed into the rectum for 10 to 12 cm. and the bowel irrigated, nothing coming away but a little mucus. The next morning this irrigation was repeated. The child had vomited freely during the night, and the vomitus was now of a stercoraceous character. The mother states that she believes there was no urination during the night. At 10 A. M., October 22nd, the baby was brought to the hospital. It was apparently well developed, a male weighing about 8 pounds. There was marked ballooning of the upper abdomen, the veins of the epigastric region being dilated and tortuous; there was a tympanitic note over the belly wall and the skin was glazed and stretched from intra-abdominal tension. Vomiting was regurgitant and continuous, and irrigation of the rectum with sterile water was without result. An imperforate rectum was diagnosed, and a left colostomy was decided upon. Novocaine, ½% was used. The peritoneum was found to be thickened and heavy and on being opened there was a rush of fecal matter. We had hoped that this evacuation was from a distended colon, but a small loop of bowel presented into the wound which proved that the peritoneal cavity had been gained and not the large gut. A tube was placed in the cavity for drainage, and the tissues brought together with catgut. The child died in six hours. Only a partial autopsy was permitted:

Incision was made from the ensiform to the pubes. The intestines were turned out with difficulty as there were marked adhesions posterior to the umbilicus. These dense adhesions required excision of the parietal peritoneum about the umbilicus before the intestine could be liberated. It was then seen that the small intestine about 12 to 14 inches from the ileo-cecal valve had ended as a blind pocket. The mesentery was likewise deficient between the proximal and distal ends of the intestine, and there was a gap of two inches between the blind ends of the intestine. About 2 inches proximal to the umbilical adhesion the enormously distended intestine had ruptured along its convex border extravasating

its contents into the peritoneal cavity. Nature had evidently attempted to establish a fistula at the weakest point of the abdominal wall. The distention of the intestines extended proximally, involving the stomach wall also. The distal segment of the gut was about the size of a cigarette as far as the ileo-cecal valve, and from there on it was represented only by a firm fibrous cord which, however, had a lumen with its mucosal development evident throughout.

Aside from the greatly thickened peritoneum, the injected heavy walls of the gut and the evident protective peritonitis from intestinal extravasation, no further intraabdominal abnormality was noted.

Pathological report of the specimen by Dr. Ward H. Cook, Professor of Pathology, Medical College of Virginia:

"The specimen as received in the laboratory consists of two segments of intestine with a small portion of mesentery attached to each. The material has been hardened in formalin.

Fig. 1. Author's case. Drawing of the condition in situ. Note the mesenteric deficiency, the distended proximal segment and the atrophic distal segment.

"The proximal segment measures 75 cm. in length. Its largest diameter is 2.5 cm. at approximately its midpoint. At this level the intestine is filled by brownish-green semi-gelatinous material. The lumen is patent throughout. The proximal 17 cm. is collapsed and practically empty. The distal 15 cm. of this segment is also collapsed and empty and forms a coil bound down by fibrous adhesions and firmly attached to the omentum. In this region are two wide perforations of the intestine. These openings are close together, being separated only by an adhesive band 7 mm. wide which binds the flat but smoothly rounded blind termination of this segment to the perforated intestine. Each perforation is 1.5 cm. in diameter, but the distal one is incomplete, for it is crossed by tissue-paper-like strands of submucosa and apparently necrotic muscularis. The perforations, it will be noted, are located from 12 to 15 cm. above the actual end of the proximal segment of the intestine at a point where it is compressed by an adhesive band and is adherent to omentum and abdominal wall. Occasional small patches of lightly adherent fibrin can be stripped from the smooth serous surface of the intestine and frequent fibrous tags are attached to the otherwise smooth, glistening surface.

"The distal segment of the intestine measures 58 cm. from its blind, smoothly rounded beginning, to the ileo-cecal valve, and 27 cm. from the ileo-cecal valve to the point of excision. This segment terminates proximally as a somewhat flattened but smoothly rounded closed tube 1.2 cm. in horizontal, and 0.8 cm. in vertical diameter. The intestine becomes cylindrical and rapidly narrows to a diameter of 0.7 cm. and then gradually enlarges to 1.9 cm., while 23 cm. below the origin it rather abruptly swells to 1.7 cm. and then diminishes gradually to an average diameter of 0.7 cm. which is held until the ileo-cecal valve is reached. The cecum is of the same diameter, and by a uniformly conical tapering gives rise to the vermiform appendix 3.5 cm. in length and 0.2 cm. in diameter.

"The colon is impressively small. The ascending portion is 6.5 cm. long, and only 0.5 cm. in diameter. The transverse colon, accidently stripped of omentum and muscularis, is 8 cm. long, and the descending and sigmoid portions 10 cm. in length, average 0.5 cm. in diameter.

"The intestinal tract, sectioned at several levels, is clearly patent throughout excepting for the gap which exists between the proximal and distal segments. Examination of the contents shows in the upper third of the distal segment a central core of brown granular material surrounded by a firm grayish substance. At its widest diameter the lumen is filled by hard, dark brown material in which are small gray areas. Below this the small intestine contains a soft, grayish, pasty material. At the ileo-cecal valve this substance suddenly ceases although the valve is widely open. The cecum and colon contain a milky white semi-gelatinous substance.

"Microscopic examination reveals several intestinal glands at different levels in the small intestine greatly dilated and filled with inspissated, eosin-staining mucus and polymorphonuclear leucocytes. Similar plugs of mucus and leucocytes are frequent in the contents of the distal segment of the small intestine, which otherwise consists for the most part of amorphous eosinophilic material, desquamated necrotic cells and a few small hair shafts. A uniformly finely granular coagulin with amphoteric staining properties partially fills the colon.

"The finding of hairs in the small intestinal contents of the distal segment is good evidence that these two portions of the intestinal tract, once continuous, became separated fairly late in the development of the fetus. For although hair follicles are indicated between the second and fourth months, fully formed hairs are rarely seen before the eighth month and it seems reasonable to suppose that they can have reached the ileum only by being swallowed with the amniotic fluid. Abnormalities of necessarily early origin may thus be eliminated by the finding of abundant meconium in the small intestine distal to the point of separation. Why meconium has not passed into the colon is not answered by the small size of this viscus, for it communicates freely with the ileum. Its walls, however, are notably thinner than those of the distended small intestine, a fact which would indicate a retardation in the development of the colon, on the one hand, and an hypertrophy of the small intestine to overcome obstruction, on the other. In the proximal segment the intestinal wall at the level of greatest distension is 1.5 mm in thickness, in the distal segment it measures 0.6 to 1.0. That of the colon is about 0.5 mm. and the mucosa is thrown into four symmetrically placed longitudinal folds.

"Altogether the most probable interpretation of the unusual findings in this case is that offered by Forssner (1907 *Anat. Hefte*, 63, 1-163) who describes a case similar to this one, inasmuch as the muscularis passed smoothly around the blind ends of the completely divided intestine; and who explained the finding of meconium below a complete atresia by possible adhesions of valve-like folds of mucosa. Although such temporary folds are more common in the upper portion of the intestine, yet he thinks it probable that they may be found at any level and so mark the location of abnormal stenoses or even result in complete separation of the intestine.

"Although the intestinal coils at the termination of the proximal segment are firmly adherent at the umbilicus it does not seem likely that this adhesion dates from the early umbilical hernia period, nor that the complete separation of the intestine is due to an unusual method of separation of the yolk stalk. The presence of meconium in the distal segment destroys this as a possibility. The multiplicity of fibrous adhesions points to local inflammation as a cause for attachment of the intestine to the abdominal wall rather than an embryological error. But we are at a loss to discover the irritant unless we are to suppose that the present extensive perforations are not the first breaks which have

occurred in the intestinal wall. Possibly there has been some previous leakage of non-infective yet irritating contents. As a result adhesions have formed behind which the extensive perforations now noted have taken place. This would presuppose that the hypertrophied muscle of the intestine has actually forced an opening by contraction against this point of resistance. The microscopic examination, however, shows no sign of a previous infectious lesion."

Fig. 2. Author's case. Intestines removed showing the greatly distended proximal segment with the point of rupture, the two non-communicating ends with mesenteric deficiency and the atrophic state of the distal ileum and colon.

ETIOLOGY.

I have arbitrarily divided the causative factors of intestinal occlusion into (1) maternal and (2) fetal.

1. Maternal. Ozenne states that he believes that intestinal dystrophies are rarely produced by syphilis. Schottelius in one of his cases found the cause in luetic hepatitis and perihepatitis; others attribute the atresia to adhesions resulting from enteritis in the embryo. The frequency with which other developmental anomalies accompany atresia of the duodenum tends to eliminate the theory of intrauterine disease.

2. Fetal. In 1839 Ammon reported a case and attributed the occlusion to arrested development of two parts. Struebel and Valenta thought the condition due to volvulus with failure to return to the normal condition, this resulting in peritonitis with disturbance of blood supply and atrophy of the part. Schottelin and Silbermann suggest fetal peritonitis, probably luetic. Kutner and Wyss think it may be caused by lesions of the arteries, or their absence, or that vascular accidents may be instrumental in this lack of development. In the case of Little and Helmholz there was an absence of arteries at the site of the missing part. Kreuter and others hold to the theory that atresiae are the result of the suspension of the process of canalization of the solid intestinal cord which exists in the early fetal life of vertebrates. Kreuter also states that in persistent atresia the embryonic filling in of the intestinal lumen is ultra-intensive; the mesoderm is thereby deprived of stimulus and instead of the normal intestine there is a hypoplastic cord. The supposed influence of enlarged valvulae conniventes has also been brought out as one of the causes of single or multiple intestinal atresia.

Owen and Lake in reporting a case in which the obstruction was one foot above the ileo-cecal valve, and due to a band which arose from the mesentery and descended to the upper surface of the bladder, where it appeared to blend with the urachus and so passed up to the umbilicus, state "There is little doubt that it was the remains of the *vitelline* artery of the embryonic circulation coming as a branch from the superior mesenteric. There was no diverticulum. Upon dividing the band the underlying portion of the bowel was found to have a linear band of gangrene, with mucosa exposed. Between this point and the ileo-cecal valve the intestine gradually narrowed down and lost the meconium (bile) staining."

The regularity of the anatomical picture and the typical localization of duodenal atresia would rather indicate a uniform etiology. Tandler was the first to propose a rational theory. In his embryonic studies he noticed that the lumen of the intestine in the fetus is completely filled up by proliferating epithelium at a certain period in its development. He concluded that in congenital intestinal atresia, this embryonic atresia becomes stabilized.

Kreuter confirmed and developed the theory. Ten human embryos, ranging in age from five to ten weeks, were examined in serial sections. In the five weeks old embryo, the intestinal lumen was found to be easily accessible. Later, the lumen was filled with epithelial elements.

At the half-way point in the embryonic series, the proliferation of the entodermal epithelium reached such a point that the lumen disappeared. In the embryo of seven or eight weeks, holes appeared and ultimately united forming a new lumen. The cells, however, did not disappear; they were utilized by the intestine to increase its length and breadth.

This normal embryonic atresia becomes permanent and sometimes multiple, when all of the surplus cells fail to be detached; if only a part of them are loosened, stenosis results.

Forssner places the causes thus in order of frequency:

1. Developmental defects, including snaring at the navel.

2. Fetal accidents, i.e., intussusceptions, volvuli, kinks.

3. Fetal diseases, i.e., peritonitis and ulceration.

In the first group the occlusion is caused by a thin membrane which usually consists of a mucosal and a submucosal layer. A number of writers regard this membrane as an hypertrophied Kerkring's fold or as two Kerkring folds grow together, when both

the muscular and serous layers are intact.

H. S. Clogg sums up the question well, and says "that most, if not all, malformations in the duodenum are associated in some way with the development of the large glands from this region; that many single occlusions of the small intestine are referred to Meckel's diverticulum; that snaring of the intestine by the umbilical ring accounts for some cases, and probably this is of more importance than has hitherto been thought; that volvulus doubtless accounts for a few cases, but that there is no satisfactory evidence that intestinal ulceration has anything to do with atresia; that fetal peritonitis has a very limited, if any, application in the cause; and that unusual cases with multiple points of atresia are very difficult of explanation and are probably due to many causes acting together."

Other etiological factors that have been brought out by different authors are developmental, peritonitis, post-ulcerative contraction, embolism or thrombosis of mesenteric vessels, and proliferation of hepatic tissue in the region of Vater's papilla. Torsion of the axis of the mesentery, the so-called invagination theory (which assumes that invagination can occur in the fetal period), and that atresia develops after the invagination is spontaneously overcome, and intrauterine peritonitis, with its consequent formation of adhesions and bands. Opponents of the latter theory rightly point out that this explanation does not account for the transformation of the intestine into a cord or the comparative stability of localization.

But it is to that important intrauterine structure which under normal conditions is doomed to desuetude at birth, its anomalies and occasional refusal to follow biologic laws—Meckel's diverticulum, that I wish particularly to call attention, for the significance of the vitello-intestinal duct is evident. Meckel in 1812 gave an accurate description of its embryological development, although Rutch had called attention to the condition in 1698. In the early embryo, indeed, in the sixth week the stomach and cecum are beginning to be differentiated. Soon there is the development of the umbilical vesicle or yolk sac. It is large, and communicates with the gut. This communication becomes narrower and more attenuated and goes to the yolk sac as the omphalo-mesenteric vessels. A persistence of this yolk stalk forms Meckel's diverticulum which may arise at any point in the *small* intestine from the duodenum to the caput coli. Bland Sutton in his well known Erasmus Wilson Lecture draws attention to the vitelline duct and the possible interruption of the bowel by it, and states that Meckel's diverticulum arises from 30 cm. to 1 m. from the ileo-cecal valve; Quain gives the average at 43 inches above the ileo-cecal junction, the limits being 11 to 120 inches; Birmingham gives its location at 32½ inches, with limits of 6 to 144 inches above the ileo-cecal valve.

Eisendrath reviews the various types of the vitello-intestinal duct:

(1) A complete canal opening at the umbilicus at one end and into the ileum at the other. This type is comparatively rare.

(2) A canal opening at the umbilicus but ending blindly at a variable distance within the abdominal cavity.

(3) An intermediate portion of the duct remains having no communication externally at the umbilicus or internally into the gut, but forming a cystoma due to retention or secretion.

(4) The tube is limited to the proximal end of the canal opening into the ileum. (Meckel's diverticulum.)

(5) The cord containing the umbilical vessels may persist as an independent structure and be attached to the umbilicus separately. This vascular cord may either take an independent course, or the vessels may run along the free border of the mesenterioleum of the diverticulum, or finally they may run from the tip of the diverticulum and form a cord commonly known as the terminal ligament.

(6) The diverticulum may be either absent or very rudimentary, and the only evidence of the presence of a congenital condition be a cord (containing the umbilical vessels or traces of them) extending from the mesentery to the umbilicus.

Professor P. Thompson reports a case and felt assured that the atresia lying within the sphere of influence of the vitelline duct, may have arisen when the duct was separated from the summit of the intestinal loop at the end of the first month.

The abnormal persistence of the omphalo-mesenteric duct and Meckel's diverticulum, with consequent laceration of the intestine and atresia has been reported by several authors as the cause of intestinal atresia.

G. H. Eddington considers that excessive obliteration of the vitelline duct is one of the most frequent causes of intestinal occlusion, although he further refers to pre-natal peritonitis as a cause for intestinal obliteration in which instance the intestine may be involved at any point throughout its length, producing multiple occlusions, which atresic points might easily be found above the attachment of the vitelline duct. A discharging umbilical sinus of indefinite duration, to which no satisfactory cause can be assigned, also points strongly in favor of the presence of an underlying Meckel's diverticulum.

PATHOLOGY.

Tandler points out that the duodenal lumen in human embryos of thirty to sixty days normally is more or less completely obliterated, and Forssner confirms these observations, stating the cause of the occlusion was the resistance upon the expanding epithelium by the surrounding mesenchyme. Keible and Mall state that they found an embryo of 11.5 mm. with the epithelium of the lower portion of the intestine blocking the lumen in two places. It is probable, as Clogg has brought out, that the process of atrophy of the vitello-intestinal duct may be the cause of the atresia without any volvulus. Kuliga calls attention to the fact that surfaces covered with epithelium do not permanently unite. Even if the epithelium dies, there is regeneration.

In a series of 328 cases Sprigg states that 28% are at or about the duodenum, 38% jejuno-ileum, 6% colon, 8% unclassified and 20% multiple.

Intestinal occlusions are most often *single* and when multiple are found in the small intestine and are usually more than two in number. Complete occlusion is the most frequent type encountered. In cases of multiple constrictions it is very usual for some of the occlusions not to be complete, i.e., stenosis and atresial.

Forssner classifies the pathological types into three groups: (1) in which a simple diaphragm of mucous membrane across the lumen of the bowel causes either complete occlusion or stenosis; (2) in which a breach of continuity of the bowel is found, with two blind ends united by a cord; (3) in which the breach of continuity is complete, and the two blind ends are free and unconnected.

Spriggs amplifies the pathology of intestinal stenosis and atresia and recognizes the following (figure 3):

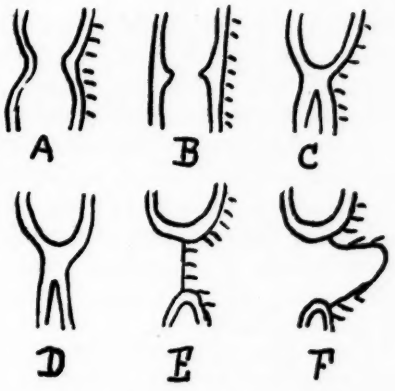


Fig.3. After Sprigg. See text.

A. Simple narrowing, more or less marked.
B. Perforated diaphragm.
C. Complete diaphragm.
D. Short band, connecting the ends of the bowel.
E. Threadlike band, along the free edge of the mesentery, the ends of the bowel being some distance apart.
F. Gap in mesentery also, there being no direct connection between the ends of the bowel.

The septal division in most instances possesses all the normal coats of the intestines and are, therefore, not hypertrophied valvulae conniventes or cicatricial, although Thorel described a case of multiple atresia in which the small intestine was divided into segments by hypoplastic cords. The uppermost occlusion was probably due to a rotation of the axis; the mesentery was shriveled and adhered to the root and there were signs of inflammation.

The lower occlusions were provided with a free, mobile mesentery. In one intestinal segment, Thorel found an ulcer, which penetrated the entire mucosa; in another segment was a membrane which completely closed the lumen and in a third a semilunar membrane which occupied almost half of the lumen. In other places mucosal folds projected into the lumen.

These findings indicated the possibility of earlier ulcers which had cicatrized and given rise to folds and membranes. The cords showed all the elements of the intestinal wall excepting the mucosa. Thorel assumed, therefore, that they originated from the stretching of the membranes, a process which would result from congestion of the intestinal contents with the closed segments of the intestine. The length of the cord would depend on the degree of the congestion. The long bands consisted of connective tissue only.

Another type of this septum is described by A. B. Herrick who reports a case of a baby, age 4 days, laparotomy, death. Necropsy showed four complete congenital occlusions of the small bowel, the first one 28 cm. from the pyloric ring, and the form of occlusion was that of a thin tissue diaphragm lined on its upper surface by the usual type of mucous membrane, while below it had a smooth parchment-like surface. The duodenum and jejunum were much dilated and the walls thickened. The second obstruction was 15 mm. below the first and was a fine solid cord of tissue 3 to 4 mm. in length and about 1 mm. in diameter. The third obstruction was 10 cm. below the second and similar in nature. The fourth was 42 cm. below the third and was a membranous partition like the first except the segment of the bowel and partition were smaller.

And still another type of the septum in which the mucosa alone produces occlusion is reported by M. R. Bonneau in a case of a baby who three weeks after birth had passed no meconium. The rectum was normal, the little finger could be introduced noticing a normal caliber of the intestine. A urethroscopic tube was inserted for 10 cm. at which point he could see a mucus veil of valve-like form behind which the meconium had accumulated. This veil was severed with the actual cautery.

In all cases of intestinal occlusion the bowel proximal to the constriction is greatly distended and heavy from infiltration and venous block, the mesentery elongated and congested, with petechial hemorrhagic spots from traction and the actual weight of the gut, and although the thickening and hypertrophy of the intestinal wall shades off proximally as it is traced upwards there is still the pronounced distension which becomes relatively less. The gut below the site of impediment is cord-like, hard, small and white, and may or may not possess its mucosa. This is interesting as the transverse colon is developed at the third month, and the ascending colon at the fifth month.

SYMPTOMS.

The symptoms of obstruction at birth are identical whether there is atresia or mechanical obstruction. It should be remembered that rectal atresia practically always occurs within two inches of the anus. Wrong diagnosis leading to perineal operations causes a loss of valuable time. Inspissated meconium may cause complete obstruction which may be fatal, or may be spontaneously relieved. For this reason it would seem justifiable to give gentle massage and enemas a fair test.

There can be no differentiation between single and multiple atresic points, the higher the location of the occlusion the sooner and more pronounced the *vomiting*, which is always present and may begin immed-

iately at birth or be delayed till the third day contingent upon the proximal distension of the gut. The vomiting is forcible at first, later the efforts are weaker, due to the general and progressive prostration, and regurgitation of all ingesta occurs shortly after taking. *Distension* is noted particularly in those cases of ileal occlusion and the ballooning seems to be particularly marked in the upper abdomen and is symmetrical. *Anuria* is constant and severe. *Convulsions* have been noted in several reported cases. The normal *icterus* neonatorum if present is aggravated by intestinal occlusion, particularly so if the condition is above the papilla of Vater. Savariand calls it the hypertension of the biliary tree. *Peristaltic waves* have been recorded running from right to left in duodenal atresiae and irregularly in the abdomen if the condition is lower. *Engorgement of the venous plexus* in the abdominal wall may be well defined. *The umbilical stump* looks congested and redder than would obtain with the normal infant. *Constipation* is usually absolute, although a little colorless mucus may be passed spontaneously or on repeated soap-sud enemas a cast of the bowel may come away bearing the meconium. Walz pointed out the value of microscopic examination of the meconium in diagnosis. We know that under normal conditions the meconium of the new-born contains among other elements bile, epithelial cells, fat globules, cholestrin crystals, mucus, vernix caseosa and lanugo. Since these elements make their appearance in the fifth month of fetal life, their absence in the meconium of the new-born indicates congenital atresia which had developed before the fifth month. This symptom of course loses its value in incomplete atresia or in atresia which develops after the fifth month.

Bacteriologic examination of the meconium is another aid in diagnosis. In complete atresia the intestinal contents below the occlusion are sterile.

Bile. Giese and Benecke showed the possibility of secretion of biliary pigments by the intestinal mucosa. Ylippo demonstrated the fact that fetal blood contains a larger percentage of biliary pigment than does adult blood, and that the content increases with the age of the fetus. This fact can be most significant in diagnosis. C. M. Howell refers to a case which died 8 days after birth, having become progressively weaker since admission. Seven feet from the pylorus the small intestine came to an abrupt termination and for a space of two inches was wanting. It is noteworthy that meconium was passed soon after birth, and that it was of normal color, though the bile could scarcely have reached the lower gut.

Emanuel refers to a case of multiple occlusion, and quotes Rolleston and Foster, stating that in congenital occlusion of the bile duct and congenital absence of the liver a normal meconium was passed. There have been cases in which meconium stools have been recorded in blocks, the occlusion being below the entrance of the duct. Serr, in necropsies, repeatedly found the middle portion of the duodenum completely enclosed in the head of the pancreas without any evidence of coincident atresia or stenosis.

DIAGNOSIS.

The diagnosis is made by the accoucher, who refers the case to the surgeon. Evidences of intestinal obstruction somewhere along this tube are evident, inspection, enemata and irrigation tell us of the lower bowel for the water returns colorless on frequent attempts, though it may bring away on one occasion some epithelial debris. A fluoroscopic examination or roentgenogram of a leaded ureteral catheter gently inserted may give valuable information although we would urge no loss of time in operating as the infant's chance for recovery are most remote at best, and any unnecessary delay still further augments the mortality.

If the vomiting is due to a duodenal block there is an absence of the marked abdominal distension seen in intestinal atresia. The violent peristaltic waves may be noted running from left to right, the act of vomiting is more frequent and if proximal to the biliary tree, as would obtain in a complete pyloric stenosis, the tests for bile would be wanting, although Louise Cordes reported a case in which there was demonstrated to be an abnormal branch of the common bile duct or rather a double opening, this supernumerary tube discharging bile above the point of pyloric occlusion. Duodeno-jejunal atresia presents practically the same picture as that of the pyloric occlusion, but for the presence of the bile.

It is questionable if a barium meal under the fluoroscope would give any great information, for any delay to differentiate accurately the anatomical location of the atresic site would be only further jeopardizing the life of the infant as operation is immediately indicated.

PROGNOSIS.

If an operation is not performed in complete atresia the child dies in five to twelve days with symptoms of inanition or, more rarely, peritonitis. Hobson described a case ending in rupture of the stomach. If the atresia is *incomplete,* life may be prolonged indefinitely. Perry and Shaw describe a case in an adult in which death due to an intercurrent disease was followed by a necropsy revealing an annular membranous wall, located at the border line between the duodenum and accessible to the little finger.

Tuffiier reviews operations in congenital intestinal stenosis: enterostomy 26 times; enteroanastomosies, 4 times; perineal ileostomy, 2 times. All of the cases were fatal.

Only two successful cases have been reported, and they are of such great interest that they are given in full as originally reported.

Focken's is the first successful operation ever reported in congenital atresia of the intestines:

A male seven days old was brought to the clinic with the report that there had been no stools since birth. He had vomited continually and the odor of the vomitus became increasingly foul. There was diminished liver dullness and tympany throughout the rest of the abdomen, which was moderately arched and soft. On the following day it was more distended and harder, and the vomitus was distinctly feculent. Hyperperistalsis was plainly visible through the walls of the abdomen. Congenital atresia was suspected.

Operation. The slightly bleeding umbilical cord was excised and median laparotomy was done. A considerable quantity of clear serum was found in the abdominal cavity.

A number of dilated loops of the small intestine bulged forth, all with shining serosa. In the lower left corner lay a ball of collapsed loops of small intestine. The transition between the two portions, according to estimate was located at the borderline between the lower and middle third of the small intestine, and presented the relations pictured in figure 4.

A normally developed intestine, with lumen, was lacking for a distance of about 4 cm. At the border of the mesentery it was roundish, slightly flattened, which ended in the two portions of the intestines, though not exactly in the blind portions.

There was no trace of inflammation or adhesion in the abdomen, and no further abnormalities in the intestines themselves.

A lateral entero-anastomosis was then done. Posterior sero-serous suture with individual silk button-sutures. After the lumina was opened, a continuous silk suture was inserted, first in the posterior wall, then in the anterior, and then an anterior sero-serous suture with individual silk-button sutures. The abdominal wound was closed with a single row of silk button-sutures.

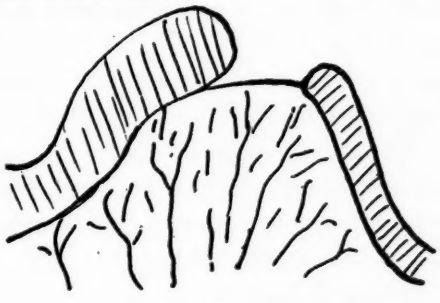


Fig. 4. Focken's case.

The operation lasted almost an hour and was followed by good results. During the next two days the vomitus was less feculent and after this time ceased entirely. There were three stools on the day following the operation.

The temperature on the morning after the operation was 40.1° C.; on the following evening 38.4° C. and thereafter normal.

The stitches were removed on the sixth and tenth days and the child was released on the twelfth day as cured. A threatened diastasis of the recti muscles was prevented by the use of adhesive plaster.

Five months after the operation the child was well-nourished, and the stools were normal. He seldom cried, showing that no stenosis remained.

The atretic section need not be resected. For technical reasons the lateral anastomosis is probably best in all cases.

The case disproves Braun's statement that entero-anastomosis probably cannot be done successfully.

The second case is that of Ernst and is as follows:

Boy, born November 19, 1914, normal delivery, vomited from first. Took the breast, but could not keep milk. Diagnosis of high-seated stenosis or atresia was made and operation advised.

Operation under ether, 35 cm. taken. After the anterior sheath of the rectus had been laid bare, Mosetig batiste was sewn to the edges of the skin with continuous silk suture so that the integuments were completely covered. On opening the peritoneum the dilated stomach protruded into the wound, and was traced along the dilated pylorus into the duodenum, which was uniformly of about two finger-breadths in width, as far as it could be traced to the upper side of the transverse mesocolon. But below the colon where the intestine reappeared, at the flexura duodeno-jejunalis, it was seen to have collapsed to the calibre of an ordinary pencil, about 8 millimeters in diameter. A duodeno-entero-anterior anastomosis was made—that is to say, a coil of small intestine about four inches below the flexura duodeno-jejunalis was drawn up *in front* of the transverse colon, and united to the duodenum about the junction of the pars superior and pars descendens. The child was little affected by the anesthetic or by the operation which lasted about 1¼ hours, on November 30. A few hours after operation, 30 c.c. of a weak solution of milk and water was given and repeated every two hours. There was some vomiting, and later some greenish fluid was evacuated by stomach tube. On December 2, he had eleven meals and one teaspoonful of castor oil twice, three enemata, and altogether four alvine discharges which without doubt contained digested milk. Five days after operation he was sent home to be nursed by the mother. The dressings were untouched until the fourteenth day. On October 15, 1915, he was well developed, vigorous, remarkably quiet for his age.

TREATMENT.

Without operation there is early death. Ano-rectal block must be excluded. For occlusion about the duodenum the Ramstedt operation or gastroenterostomy must be carried out.

In those cases of suspected intestinal atresia the following suggestions are offered:

1. Protect the infant warmly.
2. Use local anesthesia—procaine.
3. Use a median incision, excising the umbilicus.
4. If one *single* point of atresia is found in the lower ileum or colon anastomosis is preferred, if the distal segment is too shrunken establish (entero)-colostomy; remember, however, that the lower segment can be greatly dilated by rectal injections.
5. If multiple points of atresia exist, short circuit; if these points extend over too long a segment enterostomy may at least be tried.

BIBLIOGRAPHY.

1. Aldehoven: Ein beitrage zur Entsteburg der angeborenen Dunndarmunterbrechung (Dunndarmatresie). *Arch. f. Gynaek.*, Berl., 1920, **112**, 443-458.
2. Archambault (J. L.): Atresie congenitale du tiers superior de l'intestin grele avec etat rudimentaire de tout le tube intestinal au-dessous. *Rev. med. du. Canada*, Montreal, 1904-5, **7**, 198-204.
3. Baugher (A. H.): Congenital atresia of the small intestine. *Tr. Chicago Path. Soc.*, 1913, **9**, 34-36.
4. Bazin (A. T.): Parental volvulus of small intestine. *Canad. M. Ass. J.*, Toronto, 1915, **5**, 697.
5. Benn: A case of internal incarceration due to a hole in the mesentery of a new-born child. *Arb. a.d. Geb. d. path. Anat. zu Tubing*, Leipz., 1914, **60**, 129-133.
6. Bogart (F. V.): Congenital atresia of the small intestine. *Arch. Pediat.*, N. Y., 1918, **35**, 45.
7. Van der Bogart (F): Symptomatology of congenital intestinal obstructions. *Arch. Pediat.*, N. Y., 1916, **33**, 194-196.
8. Bradford (O. F.): Congenital constriction of the Gastrointestinal tract. *J. Missouri M. Ass.*, St. Louis, 1918, **15**, 39-46.
9. Buchwald: Multiple congenital atresia of the small intestine. *Wein med. Wchnschr.*, 1921, **71**, 43.
10. Cowell (E. M.): Congenital occlusion of the duodenum. *Quart. Jour. Med.*, 1911-12, **5**, 401.
11. Davis (L.) and Richardson (O.): A case of congenital occlusion of the small intestine. Operative autopsy. *Boston M. & S. J.*, 1906, **154**, 266-269.
12. Drennan (L. M.) and Clark (H. C.): A congenital malformation of the intestine, multiple points of complete obstruction. *Amer. Jour. Diseases of Children*, 1915, **10**, 360-362.
13. Edington (G. H.): Congenital occlusion of the ileum. *Brit. J. Child. Dis.*, Lond., 1906, **3**, 53-58.
14. Edington (G. H.): Congenital occlusion of the esophagus and lesser bowel. *Glasgow Med. Jour.*, 1913, **80**, 16-33.
15. Eitel: Congenital stenosis of the upper jejunum, under a clinical picture of atresia. *Zrschr. f. Kinderh.*, Berl., 1921, **29**, 263-270.
16. Ernst (N. P.): A case of congenital atresia of the

duodenum treated successfully by operation. *British M. J.*, Lond., 1916, **1**, 644.

17. Eschbach (H.): Volvulus congenitale de l'intestin grele. *Bull et mem. Soc. anat. de Par.*, 1907, **82**, 414.

18. Fockens (P. A.): Case of congenital atresia of the small intestine. Cured by operation. *Zentrallbl. f. Chir.*, Leipz., 1911, **38**, i, 532-535.

19. Foisy (E.): Duodenal occlusion due to a congenital malformation of the ascending mesocolon. *Bull. et mem. Soc. de chir. de Par.*, 1919, **14**, 1548-1552.

20. Forssner (H.): Die angeborenen Darm- und Oesophagusatresein. *Anatomische Hefte*, 1907, **34**, 1-160.

21. Fowler (R. H.): Complete congenital atresia of the ileum. *Long Island Med. Jour.*, Brooklyn, 1916, **10**, 511.

22. Gray (A. H.): Case of congenital occlusion of the duodenum (accompanying a deficiency of the hind-gut). With a note on etiology. *Glasgow Med. Jour.*, 1910, **2**, 116.

23. Habhegger (C. J.): Intestinal obstruction due to a Meckel's diverticulum; duodenal death. With a case report. *Interstate M. J.*, St. Louis, 1918, **25**, 693-697.

24. Heymann (E.): Volvulus of the entire small intestine. *Deutsche med. Wochenschrift*, June 2, 1922, 725-727.

25. Homans (J.): A study of the symptoms and treatment of congenital transduodenal bands. *Boston M. & S. J.*, 1916, **175**, 665-673.

26. Howell (C. M. H.): A case of congenital occlusion of the small intestine. *St. Barth. Hosp. Rep.*, Lond., 1906, **41**, 135-137.

27. Kimpton (A. R.): Congenital intestinal obstruction in a new-born baby. *Boston M. & S. J.*, 1914, **170**, 916, 1 pl.

28. Kirchenberger: A rare case of intestinal occlusion. *Wein. med. Wchnschr.*, 1913, **63**, 1790-1795.

29. von Koos: Congenital atresia of the duodenum. *Jahr. f. Kinderh.*, Berl., 1920, 3 F., **43**.

30. Kotzareff: Intestinal volvulus; congenital malformation of the peritoneum; anomaly of the mesenteric arteries. (Reported by Hartman). *Bull. et mem. Soc. de chir. de Par.*, 1920, **46**, 1105.

31. Landau (L.): Congenital occlusion of the intestine due to atresia of the ileum. *Deutsche med. Wchnschr*, Leipz., u. Berl., 1920, **46**, 1195.

32. Losse (J. R.): Report of a case of congenital atresia of the duodenum. *Bull. Lying-in Hosp.*, N. Y., 1916, **10**, 230, 1 pl.

33. McDonald (A. L.): Congenital atresia of the duodenum. *Am. J. M. M. Soc.*, Phila. and N. Y., 1913, **146**, 26-36.

34. Melchior: Congenital stenosis of the duodenum due to partial situs inversus. *Berl. klin. Wchnschr.*, 1914, **51**, 1161.

35. Morley (J.): Congenital occlusion of the ileum. *Brit. J. Surg.*, Bristol, 1921, **9**, 103-110.

36. Owen (S. A.) and Lake (N.): Report of a case of antenatal intestinal obstruction, with obstruction in infants. *Brit. J. Child. Dis.*, Lond., 1920, **17**, 115-126.

37. Peraire (M.): Occlusion intestinale chez un nouveau-ne atteint de microcolie congenitale avec malformations multiples de l'intestin grele; anus contre nature; mort. *Paris chirurg.* 1912, **4**, 463-468.

38. Rendu (A.) and Wertheimer (P.): Sur un cas d'occlusion congenitale de l'intestin grele. *Arch. de med. d. enf.*, Par., 1922, **25**, 349-353.

39. Ritter (C.): The origin of congenital duodenal atresia. *Jahrb. f. Kinderh.*, Ber., 1920, n. F., **91**, 369-381.

40. Rochet (P.) and Wertheimer (P.): Quelquez considerations anatomo-pathologiques et pathogeniques a propos de trois cas d'occlusion congenitale de l'intestin grele. *Lyon, chirurg.*, 1920, **17**, 561-574.

41. Rowland (V. C.): Congenital intestinal obstruction. *Am. J. Dis. Child*, Chicago, 1915, **9**, 455-458.

42. Salzmann (Mathilde): Congenital occlusion of the duodenum. *Monatschr. f. Kinderh.*, Leipz., u. Wein., 1920-21, **19**, 468-470.

43. Savariaud: L'occlusion congenitale interne chez le nouveau-ne. *Rev. d'orthop.*, Par., 1903, 2 S., **4**, 305-342.

44. Sherping (O. T.): Report of two cases of congenital obstruction of bowels. *Journal-Lancet*, Minneap., 1919, **39**, 651.

45. Smythe (F. D.): A successful posterior gastro-enterostomy seventy-six hours following a Ramstedt operation which failed to relieve the obstruction. *Memphis M. Month.*, 1920, **41**, 735-738. Also *Tr. South. Surg. & Gynec. Asso.*, 1919, Phila., 1920, **32**, 251-257, 4 pl. (Discussion) 291-309.

46. Spriggs (N. I.): Congenital intestinal occlusion; an account of twenty-four unpublished cases with remarks based thereon and upon the literature of the subject. *Guy's Hosp Rep.*, Lond., 1912, **66**, 143-218.

47. Tandler: Zur entwickelungsgeschichte des menschlichen duodenum in fruhen embryonalstadien. *Morph. Jahrb.*, 1900, Bd. 29, 187-216.

48. Trumpp: Muco-epithelial concretion in the rectum and intestinal stenosis. *Jahrb. f. Kinderh.* Berl., 1912, n. F., **76**, 678-694.

49. Wakeley (C. T. G.): A case of congenital atresia of the ileum. *J. Anat.*, Lond., 1916-17, **51**, 65-68.

50. Weber: Demonstration of congenital atresia of the duodenum. *Muchen. med. Wchnschr.*, 1913, **60**, 212. *Jahresh d. Gesellsch. f. Nat.—u Heilk*, in Dresd., 1912, 13-19.

51. Weiland (Carl): A Case of congenital occlusion of the colon at the ileo-cecal valve. *Medical News*, New York, 1896, **68**, 44.

52. Wheelon (H.): Observations on gastric and duodenal motility in duodenal obstruction. *J. Am. M. Ass.*, Chicago, 1921, **77**, 1404-1406.

MESENTERIC VASCULAR OCCLUSION: REPORT OF THREE CASES IN CHILDREN.

LOUIS FRANK, M.D., F.A.C.S.,
LOUISVILLE, KY.

So far as can be determined from a survey of available literature, the first case of mesenteric vascular occlusion was recognized and reported by Tiedeman in 1843. An extensive pathological study of the affection was made by Virchow, in 1847, who presented a more comprehensive description and published the results of his investigations. The clinical aspects of the subject were not accorded much consideration, however, until prominently brought to medical attention by the researches of Kussmaul and Gerhardt in 1863, and those of Litten in 1875. Shortly thereafter Cohnheim, Cohn and others also published the results of their experimental and clinical investigations. Jackson, Porter and Quinby in 1904 made an exhaustive study of the entire subject based on an analysis of 214 cases. Trotter's excellent monograph on "Embolism and Thrombosis of the Mesenteric Vessels" appeared in 1913. Since then the literature has been further enriched by other important contributions, and more than four hundred authentic cases are now on record.

Mesenteric vascular occlusion, whether arterial, venous, or both, may be sudden or gradual in its development, primary or secondary, partial or complete; it is usually due to embolism or thrombosis, and is almost invariably followed by hemorrhagic intestinal infarction.

The reminder seems pertinent, in this connection,

that embolism and thrombosis are not synonymous and interchangeable terms. The word thrombus signifies an existing obstructive clot in any portion of the circulatory system which may remain indefinitely at its original situs, be resorbed, become organized and continue to occlude, or disintegrate and be carried into the general circulation. An embolus represents a minute particle of material (blood clot, tissue, fat, bacterial colony, etc.) which, entering the blood current in one situation, is thence transported to another, and by its lodgment there produces obstruction. While a thrombus remaining at the original point of development may produce obstruction, a detached particle transported to another situation, and there lodging and obstructing the circulation, becomes an embolus.

The term infarction has undergone many changes and extensions so far as its definition is concerned. It was originally used in connection with the Galenic theory that "black bile" was the cause of melancholia and hypochondria; later it included obstruction of the intestinal lumen by hardened feces or precipitations from the blood; still later obstruction of gland ducts, blood- and lymph-vessels. "At present infarction is unfortunately used as a designation for two classes of pathological conditions essentially different in kind: (a) the infiltration of the tubules or tissue spaces of an organ with blood, blood pigment, uric acid or urates, calcium salts, etc.; (b) the anemic necrosis of an organ or tissue due to an obstruction of its nutrient artery by embolism or thrombosis. The different processes are usually distinguished by some modifying term, as uric-acid infarction, anemic or hemorrhagic infarction, etc.; but when used without such term is usually narrowed to the second meaning." (Warthin).

In arterial mesenteric occlusion any affection that predisposes to thrombotic formation is of etiologic significance. Endocarditis, aortic atheroma and arteriosclerosis are important causative factors. Rarely sclerosis of the mesenteric arteries has been noted without change in the aorta of peripheral vessels. When the arterial walls become inelastic from sclerotic changes the lumina of the vessels are narrowed and collateral circulation may be thus prevented. Localized calcification may progress to the point where plaques entirely occlude the vessel lumen. "Lattice-work endarteritis" causing arterial occlusion has been described, and a similar result has been reported as a terminal process in multiple neuritis.

Any disease or abnormality which causes stasis in the portal system may be an etiologic factor in venous occlusion. Of especial importance in primary occlusion are intestinal changes that permit entrance of bacteria into the vascular channels, such as enteritis; traumatic lesions, surgical or otherwise, the puerperal state, phlebitis; cachexia due to carcinomatosis, malaria, typhoid fever, septicemia, etc. Venous occlusion has followed appendicitis, salpingo-oophoritis, also local vessel wall changes produced by syphilis and other diseases. Secondary occlusion may follow hepatic cirrhosis, pyelophlebitis, syphilis, malignant growths, inflammatory or neoplastic lesions which cause portal stasis by pressure or formation of adhesions. "Venous thrombosis has been known to follow arterial emboli apparently because of the stasis thus produced."

Mesenteric vascular occlusion has been noted more frequently in males than females in the proportion of about two to one, for which no adequate reason has been assigned. No age is exempt and the affection has been observed at both extremes of life, viz., at the age of one month, and also ninety-nine years. More than fifty per cent of cases have occurred between twenty and sixty years. In the three cases to be herein reported the patients were all males, aged eight, ten and twelve years, respectively.

Unfortunately there are no absolutely pathognomonic clinical signs by which mesenteric vascular occlusion may be positively recognized; and this statement is equally applicable whether the occlusion be arterial, venous, or both. However, there are several indicative symptoms which carefully considered and properly interpreted may at least suggest the correct diagnosis, although it is regretfully admitted that in the majority of instances a positive conclusion can be reached only at operation or necropsy.

At the outset there is sudden and intense abdominal pain which may be intermittent or continuous; it may be general or localized about the umbilicus, in the epigastrium, hypochondrium, or lower abdomen; tenderness, distension and muscular rigidity are invariable concomitants. The patient usually exhibits signs of shock and collapse seems imminent; the temperature, which at first is subnormal, may later rise to 104° or 105° F.; the pulse is rapid, oftentimes feeble and irregular; respirations are quickened, and "the patient's appearance becomes a combination of pallor and cyanosis." Vomiting begins early and is persistent; vomitus at first gastric contents, later contains bright red or dark blood; fecal vomiting has been seldom noted. Diarrhea is commonly an early manifestation and is distinctly hemorrhagic in type; complete constipation later ensues from intestinal paralysis and consequent obstruction to fecal onflow. Sudden abdominal pain,

evidence of shock, the presence of blood in the vomitus and alvine dejections, are the most important diagnostic indications.

Physical examination by palpation is for the most part unsatisfactory because of tenderness, distension and rigidity. Percussion shows tympany excepting over areas thickened by edema and blood extravasation and in flanks where free fluid may cause dullness. If hemorrhage has been sufficiently extensive to cause formation of a large hematoma, palpation may rarely reveal its presence. In only a few instances has a distinct tumor been noted in mesenteric vascular occlusion.

The pathological aspects of mesenteric vascular occlusion are of considerable interest. "It has been conclusively demonstrated experimentally that the results of complete obstruction to the blood supply of an intestinal segment are represented by four distinct stages, viz., (a) necrosis, (b) gangrene, (c) hemorrhagic infarction, and (d) abscess formation." According to Warthin, the occlusion of a terminal artery by embolism or thrombosis leads to anemic necrosis of the part supplied by the obstructed vessel. In end-arteries having slight collateral anastomosis dead area remains anemic (anemic or white infarct); in situations where end-arteries possess sufficient anastomosis to admit blood into the affected area from the neighboring terminals the dead area becomes hemorrhagic (hemorrhagic or red infarct). The anemic variety is found in the spleen, kidneys, heart, brain, retina, and rarely in the liver; the hemorrhagic infarct occurs only in the lungs and the area supplied by the superior mesenteric artery, very rarely in the uterus. The sequelae of infarction are: absorption of the necrotic tissues, organization, scar formation, calcification, cyst formation, encapsulation, abscess, or gangrene. In infective embolism suppuration of the infarcted area usually occurs (septic infarct), or the infarct may be secondarily infected by pyogenic organisms. Infarction of the lungs is frequently followed by moist gangrene, infarction of the intestine almost always. (Warthin). Analysis of reported cases shows that the arteries are involved in sixty per cent, the veins in about forty per cent. For obvious reasons the former entails much greater danger than the latter.

The pathological changes occurring in the mesentery and intestine depend upon the degree of circulatory involvement. The mesentery becomes enormously thickened by diffuse edema and motility is markedly diminished in consequence; extravasation of blood is noted near the occluded vessels; when occlusion is well advanced gangrene and necrosis supervene. The intestinal lesion is almost invariably hemorrhagic infarction. The extent of the infarct varies from a few necrotic spots to involvement of the entire small and large intestine. The intestine becomes discolored—dark red, purple or black—from extravasation of blood into its coats, and is ordinarily greatly thickened because of the infiltration of blood and serum; distension of the involved segments occurs from gas accumulation, and mobility is usually absent. Blood extravasation is especially pronounced in the submucosa "where it may be so extensive as to separate the mucosa from the muscularis; the mucosa shows the most marked necrotic changes, the villi are either completely degenerated or entirely absent, Lieberkuhn's glands are distended and partly necrotic; the muscularis shows fewer changes than any other coat." The first changes shown by the microscope are: edema, leucocytic infiltration, capillary hemorrhages, and marked thickening of the tissues due to inflammatory exudate.

In the majority of mesenteric vascular occlusions the superior mesenteric artery is involved. The intestinal damage depends upon the site of occlusion. If the vessel trunk near its aortic origin be occluded the entire small and large intestine (excepting the duodenum) may be implicated; if merely a small branch of the artery be involved the corresponding intestinal segment only suffers. It must be remembered, however, that hemorrhagic infarction may occur from occlusion of either veins or arteries.

To adequately understand the mechanism of mesenteric vascular occlusion one must be familiar with the anatomy and blood supply of the area concerned. While the mesenteric arteries are not strictly "terminal arteries," anatomically, they are so physiologically by virtue of the fact that the pressure in these vessels is about 80 mm. Hg., whereas it requires nearly 300 mm. Hg. to force blood through the intestinal area; moreover, anastomosing arcades exist only in the center of the area supplied by the superior mesenteric artery. It must be remembered that the superior mesenteric artery supplies the entire small and more than half of the large intestine, exclusive of a small portion of the duodenum. Thus to this enormous field, "famous for the immense volume of its circulating fluid," there is only one means of access. When this path is obstructed blood can reach the area thus supplied only from the abdominal aorta through the celiac axis, thence its hepatic branch, the gastro-duodenal branch, then the superior pancreatico-duodenal branch which anastomoses with the inferior pancreatic-duodenal branch of the superior mesenteric, thus traversing six separate vessels which become smaller as the destina-

tion is approached. The only other route would be through the left colic branch of the inferior mesenteric which inosculates by one of its terminal branches with the left bifurcation of the middle colic. It is noteworthy that the twelve to sixteen mesenteric vessels inosculate only among themselves; all the branches of the superior mesenteric anastomose with some branch of the main trunk with the single exception of the inferior pancreatico-duodenal; and the same statement applies to the inferior mesenteric. "It is certainly surprising to note that we have here an area occupied by the most actively functionating organs in the body, a system of blood vessels capable of containing almost the whole volume of blood of the entire body, yet joining collateral channels by only two anastomoses and they are situated at either end of the arterial scheme and being connected to its inosculating branch through a series of capillary loops in one case and by a devious and circuituous route in the other. After studying the anatomic scheme here pictured, it no longer is astonishing how easy it is for an infarct to be produced in the mesentery or intestinal wall."

In explanation for the frequency with which the superior mesenteric artery is occluded as compared with the inferior, the following postulates have been enunciated: (a) the superior mesenteric artery is 9 mm. in diameter, whereas the inferior is only 3.5 to 5 mm.; (b) the superior mesenteric extends nearly parallel to the aorta, whereas the inferior leaves the aorta at an angle of about 45°; (c) the superior mesenteric arises from the aorta above the inferior and therefore has an earlier opportunity of intercepting an embolus.

The treatment of mesenteric vascular occlusion is essentially surgical; and to be effective it is imperative that surgery be early invoked. Procrastination even for a few hours is merely courting disaster and inviting a fatal termination. Medical management represents a delusion excepting insofar as it relates to nutrition and conservation of vital resistance.

It must be remembered that the indicative clinical signs outlined in the foregoing generally do not appear until supervention of intestinal infarction, hemorrhage and beginning gangrene; the condition of the patient is then serious and dissolution is often impending.

The mortality in unoperated cases is almost one hundred per cent; a few examples are recorded where the clinical diagnosis of mesenteric occlusion was made and spontaneous recovery ensued. The patient may be practically moribund when first observed, and death may occur so quickly that nothing is possible looking toward conservation of life. When seen in earlier stages, however, surgical intervention promises some hope of a successful outcome.

The hitherto exceedingly high mortality following surgical treatment has been due to delay in diagnosis rather than imperfect application of technical procedures; the greatest good to the largest number will accrue from immediate celiotomy with resection of the gangrenous intestine and anastomosis according to the method which may seem most appropriate to the individual surgeon. In some instances, where the condition of the patient precludes immediate anastomosis, the damaged intestine may be resected, the distal and proximal ends being brought through the abdominal incision for the purpose of drainage, and anastomosis postponed until later when a greater measure of safety is assured.

Where the mesenteric trunk is completely occluded near its aortic origin, exploration may reveal almost the entire small and large intestine gangrenous; under such circumstances further surgical procedure is contraindicated, prompt dissolution being inevitable. Obviously the more extensive the gangrenous process the less the likelihood of a successful outcome following surgical intervention.

CASE I. R. F., male, aged 12 years; date of first observation August 9, 1909. Family history unimportant. Previous personal history: Except for numerous attacks of what was diagnosed as "intestinal indigestion" the patient had always enjoyed good health. These attacks of so-called indigestion had recurred at varied intervals during the last several years. When a baby he had an umbilical hernia which suppurated for two or three years; about five years ago this finally healed. Since then he had complained more or less of abdominal pain.

On Friday, August 5, 1909, after eating liberally of grapes and fruit, the patient began complaining of sudden cramp-like pain in his abdomen localized about the umbilicus. Vomiting occurred and was persistent. A dose of calomel was administered, and Saturday copious defecation followed an enema. There was no further passage of feces. August 9th, after an enema, the patient passed a large amount of fresh blood mixed with mucus. During the morning his temperature was 100.4° F.; prior to that time there had been no fever; the pulse was rapid; severe cramp-like pain continued; vomiting was incessant.

There was board-like rigidity of the abdominal muscles; no masses palpable; slight distension; tenderness general but greatest to right and around umbilicus; temperature 100.5° F., pulse 140. Under ether, palpation disclosed a mass the size of hen's egg to right of umbilicus. Diagnosis: General peritonitis, cause unknown; immediate operation advised.

Celiotomy, August 9, 1909: Right median incision four and a half inches in length. Mass to right of umbilicus proved to be a coil of strangulated small

intestine about eight inches from cecum. Gangrenous portion fifteen inches in length resected. Strangulation caused by a band one-fourth inch in diameter. End-to-end anastomosis made using two rows of linen sutures; mesentery apposed by twenty-day No. 1 chromic catgut; abdominal wall closed without drainage.

Thrombosis of several mesenteric vessels was present, and there were many clots in the mesentery removed. The obstructing band consisted of the omphalo-mesenteric ligament. Operative diagnosis: Mesenteric thrombosis secondary to omphalo-mesenteric band.

The patient reacted well from the shock of the operation but died at the end of thirty-six hours. He exhibited the usual symptoms of progressive septic poisoning.

CASE II. L. C., male, aged 8 years. Family and personal history negative. Date of first observation October 1, 1919.

During the morning of October 1, 1919, the patient began complaining of severe pain above and about the umbilicus. He was given a dose of castor oil which was promptly vomited. Pain rapidly increased in severity, cramp-like in character, finally becoming localized in right iliac fossa, and the abdomen became distended. Vomiting was continuous; no defecation even after enemata; no other symptoms.

Physical examination showed no pulsation of radial or temporal artery; beats approximately two hundred over heart. Patient in deep shock; legs cold to upper thighs; arms cold to above elbows; cold, clammy perspiration; pupils dilated. Gurgling sound heard in abdomen which had become markedly distended and tender along the line of ascending and transverse colon; tenderness especially noted in right iliac fossa. No peristalsis; no tympany; some dullness in right flank. Diagnosis: general peritonitis; patient moribund. Death occurred two hours after admission to hospital.

Partial necropsy: Gangrene of entire cecum, terminal ileum, ascending colon and transverse colon so far as visible. Small intestine and appendix normal. Large amount of bloody fluid in cavity. Meckel's diverticulum present. Cause of death: Peritonitis from mesenteric thrombosis.

CASE III. S. S., male, aged 10 years. Family and previous history negative. Date of first observation August 14, 1920.

Present illness: The family physician states that the patient has had acute articular rheumatism for three weeks; that yesterday he began complaining of abdominal pain and was nauseated but did not vomit. There was free discharge of blood and mucus from rectum.

Physical examination: abdomen distended; no masses palpable; general tenderness; no purpuric spots. Diagnosis: Acute appendicitis. Immediate operation advised.

Celiotomy, August 14, 1920: Five-inch right rectus incision; abdomen filled with turbid fluid; an area of gangrenous small intestine about fourteen inches in length. Two feet of small intestine resected; end-to-end anastomosis with linen sutures; no clamps applied. Wound closed in layers with silkworm gut; no drainage. Operative diagnosis: Mesenteric thrombosis with gangrenous small intestine.

August 21st: Slight infection of abdominal wound developed. For the first few days after operation there was much gas present and acute dilatation of the stomach. Under repeated lavage with three per cent soda solution the latter condition disappeared as did also the distension.

August 28th: Patient passed considerable blood with the urine; complained of pain in region of spleen; no purpuric spots on body. The internist reported that the boy had endocarditis.

September 4th: Patient taking food regularly; wound not yet healed.

Suppuration of the abdominal wall continued for about two months; healing then occurred and the patient made a complete recovery. The family physician reports, July 15, 1923, that the boy has continued well.

The specimen removed in the foregoing case was submitted to Dr. Stuart Graves, of the Pathological Department, University of Louisville, who reported:

"Gross description: Specimen consists of approximately 35 cm. of ileum with attached mesentery. Beginning about 5 cm. from one end and extending greater distance, serosa of intestine is dark, angry, reddish-gray, dull, thickened and stiffened. Mesentery is streaked with bright red and ends of cut vessels appear filled with firm clot. The intestine is split open. In portion just described the mucosa appears necrotic, dirty, yellowish-gray and deep red. Opposite mesentery is a string of necrotic, sloughed mucosa. Proximal and lateral to this portion mucosa appears normal. Gross diagnosis: Mesenteric thrombosis; infarction of ileum."

COMMENT.

The fact that accurate pre-operative diagnosis was not made in either of the cases reported was of no importance, nor was the ultimate result affected thereby. Two patients were subjected to prompt operation; the third was moribund when admitted and nothing could be done.

In Trotter's collection of 366 cases pre-operative diagnosis was made in 13 or about 4%. In only four of Blackburn's series of 34 cases, proven by operation or necropsy, was the diagnosis made or even suspected. In but a small percentage of the 214 cases reviewed by Jackson, Porter and Quimby was the diagnosis of mesenteric vascular occlusion made prior to operation or autopsy. In the majority of instances the clinical symptoms are suggestive of acute peritonitis, acute appendicitis, or acute intestinal obstruction. Diagnostic inaccuracy is unimportant, however, from the standpoint of therapeutic indications, and immediate celiotomy with resection of the involved intestine is imperatively demanded,

provided this procedure is feasible and the physical condition of the patient warrants intervention.

According to Klein the first successful intestinal resection for gangrene induced by mesenteric vascular occlusion was performed by Elliot in 1895. Since then there have been recorded a total of probably forty cases in which recovery followed surgical intervention. In Jackson, Porter and Quimby's collection 47 patients were subjected to operation with only 4 recoveries. Later statistics, however, show a slight improvement in ultimate results. For example, S. McGuire records two cases with recovery after resection of seven feet four inches, and four feet six inches, respectively, of the small intestine. Brougham resected eleven and a half feet of the small intestine and his patient recovered. E. R. McGuire records a case in which he resected "over eleven feet" of the small intestine, followed by recovery. Park successfully resected eight feet nine inches of the small intestine. Bonnot resected seven feet four inches of the small intestine with successful outcome. Block and Goldberg performed intestinal resection for mesenteric vascular occlusion in a hemophiliac with recovery. Brady quite recently recorded fourteen cases of mesenteric vascular occlusion in eleven of which intestinal infarction had occurred; in three there had developed sufficient collateral circulation to prevent infarction. The eleven patients in whom infarction had occurred were operated upon and of these eight died.

Ross, Jopson and Reed report one case each in which the diagnosis of mesenteric vascular occlusion was confirmed by exploratory celiotomy, but as collateral circulation seemed sufficient to insure adequate function the intestine was not resected. All the patients recovered. Klein records one case in which spontaneous recovery ensued, and reviews nine others (including that of Ross v.s.) collected from the literature. In some of these cases, however, the clinical diagnosis was not confirmed by surgical exploration. The author states that for intestinal infarction there is but one method of treatment, and this is excision of the infarcted intestine and re-establishment of its continuity. "Palliative treatment should be reserved only for those cases where the physical condition does not warrant the shock of an operation or where consent is refused." (Klein.)

The death rate following surgical intervention in mesenteric vascular occlusion varies from fifty to ninety-four per cent according to available statistics. Operative procrastination is probably largely responsible for the tremendous mortality. As indicated in the foregoing, the safer plan would seem to be immediate exploration instead of wasting valuable time and probably sacrificing life by laboratory and other useless diagnostic refinements. It is sufficient for the experienced surgeon to know the patient has an acute intraabdominal lesion which can possibly be relieved, and life prolonged by prompt rational operative measures. In no other way can the tremendously high mortality of mesenteric vascular occlusion be reduced.

REFERENCES.

Blackburn: *Southern Medical Journal*, 1916, **9**, 810.
Block-Goldberg: *Annals of Surgery*, 1921, **73**, 229.
Bonnot: *Medical Record*, 1918, **93**, 502.
Brady: *Archives of Surgery*, 1923, **6**, 151.
Brougham: *Surgery, Gynecology and Obstetrics*, 1907, **4**, 782.
Eisenberg-Schlink: *Surgery, Gynecology and Obstetrics*, 1918, **27**, 66.
Elliot: *Annals of Surgery*, 1895, **9**, 21, cited by Klein, l. c.
Frank: *International Journal of Surgery*, 1913, **26**, 353.
Hendon: *Louisville Month. J. of Med. and Surg.*, 1905, **12**, 44.
Jackson-Porter-Quimby: *Journal of the A. M. A.*, 1904, **43**, 43, etc.
Jopson: *Annals of Surgery*, 1921, **74**, 799.
Klein: *Surgery, Gynecology and Obstetrics*, 1921, **33**, 385.
McGuire (S.): Cited in *Internat. Abstr. Surgery*, 1923, **37**, 129.
McGuire (E. R.): *Surgery, Gynecology and Obstetrics*, 1913, **16**, 40.
Park: Cited by Hendon, l. c.
Reed: *Annals of Surgery*, 1921, **74**, 797.
Ross: *Annals of Surgery*, 1920, **72**, 121.
Tiedeman: Cited by Eisenberg and Schlink, l. c.
Trotter: "Embolism and Thrombosis of Mesenteric Vessels," 1913.
Warthin: Reference Handbook of the Medical Sciences, **4**, 868, **3**. 123 and **3**, 791.

A CONSIDERATION OF MESENTERIC CYSTS; WITH REPORT OF A CASE.

ROBERT PARKE BAY, M.D., and J. HERBERT WILKERSON, M.D.,
BALTIMORE, MD.

In the past mesenteric cysts have been considered rare; in recent years more cases have been reported. The usual location of the cyst is at or near the ileocecal valve, although cases have been reported where they have occurred in any part of the intestine. Light was first thrown on the condition by Rokitansky in 1842. Since then approximately 250 cases have been reported.

There are no positive symptoms or signs by which one can diagnose mesenteric cysts, although pain is more frequent with this condition than any other type of abdominal cystic tumor, and the history of repeated attacks of abdominal pain associated with frequent vomiting and often with alternate attacks of diarrhea and constipation is highly significant.

It has been stated that these attacks are due to increased peristalsis trying to overcome the narrowing of the valve produced by pressure of the cyst upon the bowel lumen. These attacks may also be

due to partial volvulus, and cases have been reported where the narrowing was so great that complete obstruction occurred. A volvulus may also become complete; strangulation and gangrene of the gut, due to pressure, have been noted.

The tumor is usually rather mobile, both laterally and longtitudinally, that is, if it is embedded in the mesentery of the small bowel, and if it has not become the seat of an inflammatory process, or tied down with adhesions. This was characteristic of the present case, as was seen at operation, but if the tumor completely fills the abdominal cavity this would not be true. The tumor itself naturally gives a dull note on percussion, but if an area of gas-filled bowel superimposes it, a resonant note will be present. Occasionally a distended loop of bowel may cross the cyst giving rise to a band of resonance surrounded by a dull area.

The roentgenogram, in certain cases, is of value by showing the relationship of the tumor to the lumen of the bowel. However, the value of this method of diagnosis is proportionate to the amount of narrowing of the bowel, from pressure of the cyst.

No case of mesenteric cyst has been recognized with certainty previous to operation or autopsy. A small cyst may give rise to no symptoms whatever, unless an acute inflammatory condition arises. Under these circumstances acute appendicitis, volvulus, intussusception, rupture of an ulcer, cholecystitis, rupture of an extrauterine pregnancy,—in fact all of the acute abdominal conditions must be considered. Any of these conditions may be so closely simulated that an exact diagnosis will be practically impossible. When the cyst becomes larger, forming a definite tumor, ovarian cysts, enormous hydronephrosis, movable kidney, retroperitoneal growths, pancreatic cysts, new growths of the intestines, the pregnant uterus, ascites due to tuberculous peritonitis or cirrhosis of the liver, are all to be thought of. Some of these can be easily ruled out, but with others, differential diagnosis is difficult. Diagnosis can frequently be made with cysts of moderate size, if due attention be given to the history, physical examination and interpretation of good *x*-ray plates. Differential diagnosis is practically impossible with small cysts and extremely large ones.

As to the origin of these cysts we do not know exactly. Moynihan and Porter believe they have a multiple origin. Moynihan classifies them as follows:

1. Serous cysts, unilocular or multilocular, containing clear serous fluid, of which the present case is a type. They are supposed to rise from dilatation of lymph channels, or from hemorrhages between the layers of the mesentery.

2. Chylous cysts, unilocular or multilocular, containing a milky fluid and supposed to arise from obstructions to some of the lacteals, although so far it has been impossible to produce them experimentally. This variety comprises one half of the reported cases.

3. Hydatid cysts, due to tenia echinococcus.

4. Blood cysts, arising from hemorrhage into preformed cysts.

5. Dermoid cysts, which are undoubtedly embryonic in origin.

6. Cystic malignant disease, possibly also embryonic in the last analysis.

Many other classifications have been given which show that the etiology of these cysts is vague. This is probably due to the condition found at operation or autopsy. The tumor may vary from walnut size to one which may fill the abdominal cavity, and it may be unilocular or multilocular. The wall is of varied thickness, usually composed of a fibrous membrane, from which all trace of histological structure is lost, due to pressure of the contained fluid. Due to this many classifications of the cysts may be misleading. Obstruction of the lymphatics and lacteals may result in cysts in certain cases, others may arise from Meckel's diverticulum, or from sequestration from the bowel during development. Most of the true mesenteric cysts are probably embryonic in origin.

As to the treatment of these cysts there are five procedures; first, aspiration; second, marsupialization; third, incision and drainage; four, enucleation: five, if the bowel is affected, excision of the cyst and resection. As may be seen, enucleation, or excision of the segment of the bowel, is the operation of choice. Aspiration and marsupialization are obsolete, except in rare cases. Incision and drainage should be resorted to only when the cyst is large, or surrounded by dense adhesions, and when enucleation or resection of the bowel is out of the question, or when extensive operative procedure may jeopardise the life of the patient. If drained, recurrence is very likely, therefore, the ideal procedure is either enucleation or excision of the bowel, with resection.

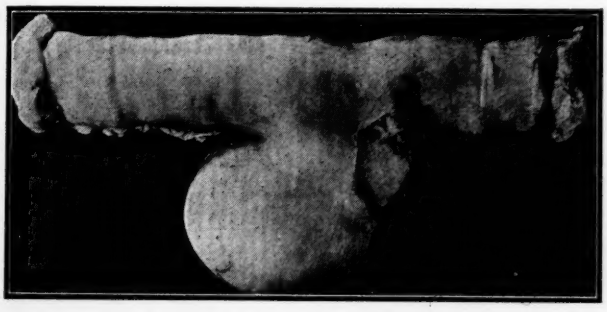
REPORT OF CASE.

On September 24, 1923, R. L., a schoolgirl of sixteen, was brought in with a diagnosis of appendicitis. She was complaining of dull, aching pains in the right lower abdominal quadrant. One month previous she had been taken with a colicky pain all over the abdomen, which later turned into violent, acute pain, and localized in the right lower quadrant of the abdomen. At this time, although the patient

was nauseated, she did not vomit. Previous to the attack her health had been good and she had been attending school daily; otherwise her history was negative.

She was a well developed, well nourished white girl, was not in much pain at the time of examination. Pulse and temperature normal, heart and lungs negative. There were definite tenderness and rigidity over the right lower abdomen. No masses were palpable. The leucocyte count was 11,000 with 78% polynuclears. Urine negative. A diagnosis of subacute appendicitis was made and operation advised.

At operation the following day, a small right rectus incision was made. The appendix, which was of the obliterative type, was easily removed, and no definite pathological change was made out. A small rounded mass was palpated in the pelvis near the midline, which was at first thought to be an ovarian cyst, but when delivered was found to be attached to the bowel in the mesentery of the ileum, ten to



twelve inches from the ileocecal junction. This cyst, which encroached upon the lumen of the intestine, was round, appeared fairly thick-walled, and about the size of a large egg. Due to the fact that the cyst encroached upon the lumen of the intestine, the involved bowel was excised and the lateral anastomosis was performed. The abdomen was closed in the usual manner without drainage. The patient made an uneventful recovery and was discharged well fourteen days after admission.

Pathological Report. Tissue (2386). Specimen consists of a portion of small intestine 12 cm. in length, showing at about the middle point on its mesenteric aspect a pear-shaped cyst measuring 6x4½ cm. The mucosa is everywhere normal, but for a distance of 2 cm. over the tumor, where it is thin and flattened, although intact. The peritoneal surface is negative. The cyst contains a clear, colorless, gelatinous fluid. The inner wall is smooth. The outer surface is covered with peritoneum; the wall is thin, measuring nowhere over 2 cm. No communication can be discovered between the lumen of the gut and the cyst, and no evidence of infection is present. Gross diagnosis: mesenteric cyst.

Sections show normal intestinal mucosa on one surface separated by a very thin layer of muscle and fibrous tissue from a cyst wall composed of a single layer of cuboidal epithelium.

Microscopic diagnosis: pseudo-myxomatous cyst of the mesentery.

BIBLIOGRAPHY.

Benedict, A. L.: Chylous Cysts of the Mesentery, *Surg. Gyn. and Obst.*, 1913, **16**, 606.

Brunner, Conrad; Campbell, R.: Zur Kasuisitik der Mesenterial und Netzcysten, *Beiträge zur Klinische Chirurgie.*

Candea, Aureal: Chyluscyste des Mesenterium, *Zentralblatt für Chirurgie*, **49**, 1922.

Coley: Mesenteric Cyst in a Child, *Annals of Surgery*, 1910, **51**, 512.

Carter: Cysts of the Mesentery, *Surgery, Gynecology and Obstetrics*, **33**, 1921.

Deaver, Harry C.: Congenital Mesenteric Cysts, *Annals of Surgery*, 1909, **69**, 618.

Forster, E.: *Beiträge zur Klinische Chirurgie*, 124; 116-138-21.

Hunner, John: Mesenteric Cyst of Jejunal Origin Complicated by Retro-jejunal Position of Transverse Colon, *British Medical Journal*, Vol. 2, 1922.

Moynihan, Berkeley G. A.: Mesenteric Cyst, *Annals of Surgery*, 1897, **26**, 1.

Naumann, Herman: Uber Einen Fall von Blutcyste des Mesocolon Transversum unter Gleischzutiger Berucksichtigung der Differentialdiagnose und Therapiedes Mesenterial cysten, *Archiv für Klinische Chirurgie*, 1921.

Porter, Miles F.: Chylous Cysts of the Mesentery, *Annals of Surgery*, 1906, **43**, 380.

Sommer, Rene: Uber Primäre Dermoide unauf Hangedaude des Darmkanals, *Beiträge zur Klinische Chirurgie*, 124, 1921.

Am. Jour. Roentgenology, **4**, 250, May 17.

CIRCULAR AMPUTATION FOR MARKED FIRST AND SECOND DEGREE PROLAPSE OF THE RECTUM.*

FRANK C. YEOMANS, M.D., F.A.C.S.,
NEW YORK CITY.

Three degrees of complete prolapse of the rectum or procidentia recti are recognized clinically. In the first degree the prolapse begins at the anal margin. Second degree prolapse begins at some point above the anus, the bowel protruding a variable distance externally. This type can always be recognized at once by feeling a sulcus between the protrusion and the anal canal. Prolapse of the third degree is virtually an intussusception of the sigmoid into the rectum but not through the anal orifice, so there is no external protrusion. Complete prolapse of whatever degree is, after all, an invagination of the rectum, or rectum and sigmoid, through the anal canal in first and second degree procidentia, and above it in prolapse of the third degree.

Concerning the *causation of prolapse of the rectum*, many theories have been advanced, any one of which may explain in some degree an individual case, but none of which will explain satisfactorily every case. The truth probably is that usually a number of elements enter into the etiology, the combined effect of which produces the prolapse. Broadly speaking, congenital or acquired mobility of the rectum and whatever causes relaxation of its supports—muscles, fascia, ligaments, peritoneum and vessels—are the basic factors of procidentia. "The passive supports, composed of fibrous and elastic tissue, lose their elasticity through gradual elonga-

*Read at the Twenty-fourth Annual Meeting of the American Proctologic Society, Los Angeles, Cal., June 22 and 23, 1923.

tion or rupture; the active supports, composed of muscular tissues, lose theirs through atrophy, injury or paralysis." (Tuttle.) In large prolapses the cul-de-sac of Douglas certainly descends but it is debatable whether this is the primary cause of the prolapse (herniation), as is claimed by some investigators, or whether it is secondary as is more probable.

Factors predisposing to prolapse are a congenitally weak fixation of the bowel; chronic debilitating diseases; spinal cord disease, more often observed in men; a solitary polyp of the rectum or lower sigmoid, acting as a foreign body; organic stricture of the bowel: and, in women, neglected perineal lacerations and hysterectomy with poor repair of the pelvic diaphragm.

The chief exciting cause is the repeated pressure of straining, as in chronic constipation or heavy lifting; irritation of the bowel mucosa, enlarged prostate with tenesmus, or the frequent coughing of chronic bronchitis. Hence, recurrent and persistent prolapse occurs most frequently in advanced age when the supports of the rectum, especially the muscles, have lost their tonicity and the factors of strain have become operative.

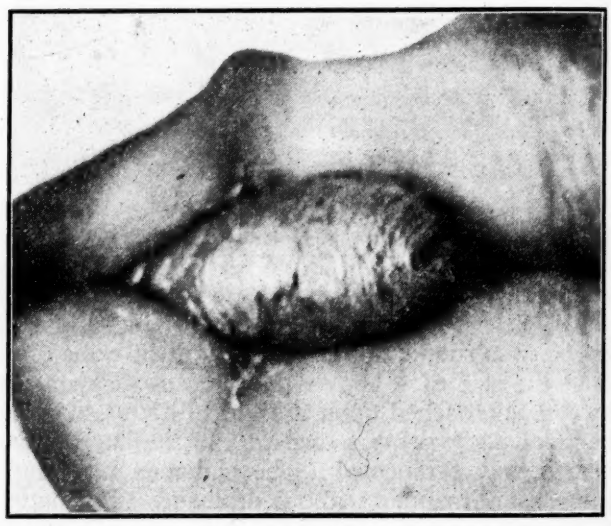
Symptomatology of first and second degree prolapse. At first the protrusion is slight, occurs only at stool and is reduced spontaneously. In the course of time the procidentia becomes larger and must be reduced by hand. Eventually the anal sphincters become so relaxed that the reduced prolapse recurs at once after reduction or as soon as the patient moves about. In certain cases the bowel finally remains permanently extruded, due to adhesions and other causes, and can not be replaced. In these constantly recurring and irreducible cases, congestion and hypertrophy of the mucosa ensue, with later induration and ulceration, and discharge of mucus, blood and pus. Often the state of the patient is indeed pitiable and elderly people, in whom this condition naturally most often occurs, can neither sit nor walk but become confirmed invalids, confined to bed, with vesical and rectal incontinence.

This is the usual course of cases of large, chronic, recurrent and irreducible prolapse. There are, however, certain instances of acute prolapse of the first and second degree, usually due to accident or injury, which present quite a different history. In these the intact functioning sphincters grasp the suddenly extruded bowel tightly; the return circulation is impeded and gangrene may follow unless prompt relief is obtained.

For the correction of marked chronically recurring or irreducible prolapse of the first and second degree, many ingenious operations have been devised, some of them depending upon the surgeon's theory of their causation. Mikulicz (*Deutsch. Gesellsch. f. Chir., Bd.* 17), proposed circular amputation for certain of these cases. I shall recite three instances in which I performed this operation successfully.

CASE I. Mrs. M. J., aged 71, was the mother of four children. The first delivery was by forceps and the perineum received a third degree laceration which was repaired imperfectly. Prolapse of the rectum began seventeen years before admission to the Central-Neurological Hospital in December, 1921. At first the procidentia was small but grew progressively larger and during the past two years had been constantly protruded.

She was an emaciated old woman, apparently not very ill, confined to bed with chronic bronchitis, incontinence of urine and feces, and a prolapse of the rectum. The procidentia was of the first degree and about five inches in length, as indicated by the photograph (figure 1). Its mucosa was superficially

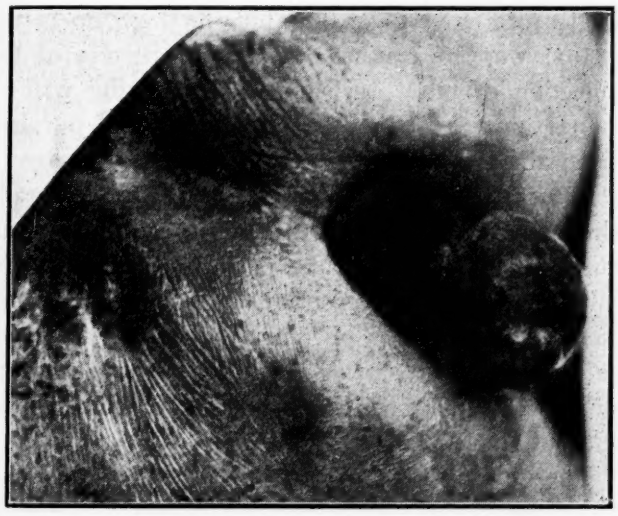


ulcerated. After reduction the prolapse recurred almost immediately, even while the patient was still recumbent. The uterus was atrophied and its cervix flush with the vaginal wall.

Operation, December 16, 1921, under gas and ether anesthesia. Lithotomy position was employed with moderate Trendelenburg tilt of the table to favor recession of the small bowel from the pelvis. Under antiseptic precautions a circular incision, one inch from the anal verge, divided the outer coat of the prolapse through the mucosa. Bleeding points were caught and tied. The incision on the anterior surface was then deepened through the bowel wall, opening the cul-de-sac. The distal cut segment was then rolled out, freely exposing the intussuscepted sigmoid colon. The latter was held with Allis forceps and divided transversely on a plane with the first incision. The entire thickness of the wall of the sigmoid was cut through, at first on its anterior surface one centimeter at a time and immediately united to the rectum by a through-and-through suture of chromicized catgut until the peritoneal pouch was completely closed. The remaining extraperitoneal portions of the rectum and the sigmoid were then

quickly amputated through the same plane and the anastomosis completed with through-and-through sutures. As the inner tube (sigmoid) was only about one-half the diameter of the outside (rectum), the posterior gap in the latter was closed by a continuous suture. A tube was introduced about six inches through the anastomosis which was then reduced. It receded about three centimeters and iodoformized gauze was packed lightly about the tube over the line of suture. The patient reacted well from the operation and the line of suture held. Eleven days later only granulations marked the line of anastomosis. The bowels were acting daily and the patient had regained control of her bladder. Unfortunately this patient developed bronchopneumonia three weeks after operation and succumbed in a few days. The anesthetic used should have been gas and oxygen or, preferably, sacral anesthesia with sacral nerve block.

CASE II. J. McC., a widow, aged 75, no children, always enjoyed good health except for her present complaint. This began five years before her admis-



sion to the hospital on December 9, 1922. The prolapse began gradually and at first could be replaced but later tended to recur and now is permanently protruded, so that the patient is comfortable only when recumbent.

Positive findings on physical examination were: chronic bronchitis, a systolic heart murmur with extra systoles, arteriosclerosis, incontinence of urine and feces and a complete first degree prolapse of the rectum. The procidentia was four and one-half inches in length (figure 2), its mucosa was thickened and in a few areas ulcerated, and it could not be reduced.

Operation was performed on December 29, 1922. In view of the chronic bronchitis and heart condition, sacral anesthesia was employed, two ounces of 2% novocaine being injected into the sacral canal.

The technic of circular amputation, as proposed by Mikulicz, was then carried out as described for Case I, except that by dividing the sigmoid obliquely the ends were approximated accurately without any redundancy of the outer coat (rectum). Unfortunately the bowels acted on the second day, so daily irrigation with normal saline solution was necessary. The anastomosis healed kindly, without peritoneal infection. Sixteen days after operation control of the bladder and rectum was regained. I examined this patient four months after operation. The result was excellent, anatomically and functionally. The bowels were acting twice daily with perfect control; urination was normal. At the upper margin of the anal canal there was a linear, annular scar having the caliber of a No. 6 Wales bougie.

CASE III. W. G., a man, aged 68, had protrusion at stool for many years and during the year before consulting me the bowel was more or less constantly out. His general condition was good except for a reducible prolapsus recti of about two and one-half inches, and a sulcus between the anus and protrusion, this constituting a second degree prolapse.

On May 19, 1923, I did the Mikulicz operation as described, with the difference that the peritoneal cavity was not invaded. Healing was prompt and anatomical and functional result excellent.

Tuttle (Diseases of the Anus, Rectum and Pelvic Colon, p. 699) states: "The conditions which seem to justify amputation are: The existence of neoplasms involving the entire thickness of the gut wall, organic strictures, gangrene or sloughing of the protruded gut, and adhesions such as prevent reduction." Tuttle entertained grave fears of peritonitis from opening the cul-de-sac during the operation or subsequent giving way of the line of suture. With thorough antisepsis and careful technic, it seems to me that the liability of infection is minimal. One fact, too, is certain, that in a case of chronic prolapse, hypertrophied and ulcerated or irreducible from adhesions, no other type of operation is feasible. Laparotomy in any one of the three cases would almost certainly have ended fatally.

The operation itself is relatively simple, there is very little hemorrhage and when performed, as it should be, under gas-oxygen or preferably sacral anesthesia, there is practically no operative shock. This is a factor of prime importance when operating upon debilitated individuals.

RECTAL FISTULA AS AN INDIRECT SEQUEL TO A RUPTURED APPENDIX.

JOSEPH F. MONTAGUE, M. D.,
NEW YORK.
Rectal Clinic, University and Bellevue Hospital Medical College; Fellow of the American Proctologic Society.
[From the Service of Dr. George David Stewart at Bellevue Hospital, New York.]

On February 11, 1923, a patient was admitted to Bellevue Hospital with the provisional diagnosis of fistula in ano. The extraordinary position of the external opening of the tract and its peculiar course suggested that the case was one of more than ordinary interest. I am greatly indebted to Dr. Armitage of Chester, Pa., for much of the previous history.

The patient was a Greek laborer 33 years old. His chief complaint on admission was that he had a foul-smelling discharge from an opening near his rectum. There had been no hereditary diseases in his family and his habits of life were apparently normal. His appetite had been good and he denied the excessive use of alcohol or tobacco. He had had no tendency toward constipation. He had not lost weight; in fact he had gained some during the months previous to his illness. His weight on admission was 150 pounds, which seemed fair for a man of his size. He denied ever having been sick previous to August, 1922.

At that time he was seized with a severe illness and entered the General Hospital at Chester, Pa. The severity of his abdominal symptoms appeared to warrant a laparotomy. A ruptured gangrenous appendix was removed and the wound was drained.

The patient apparently recovered and was discharged from the hospital about three weeks later. However, two weeks following this he was readmitted with the diagnosis of rectal abscess. Examination at that time revealed a bulging high up in the rectum and nothing abnormal in the perineum. This bulging wall was incised through the rectum and "about a teaspoonful of pus" was obtained. The surgeon at the time stated his opinion that it was not coming from the prostate but that it appeared to be derived from a pelvi-rectal abscess. Within the next day or two, however, a spontaneous evacuation of pus occurred through the perineum. This latter opening drained for over two months, the discharge being of a sero-purulent character. The man left the hospital as improved although drainage was still occurring and continued until admission to Bellevue Hospital.

Physical examination of the patient at the time of admission showed nothing abnormal with the exception of the local condition. This may be described as follows: In the anterior portion of the perianal region was a wide orifice about two centimetres in diameter. This opening and the tract leading from it appeared but moderately indurated, being scarcely palpable on digital rectal examination. The aperture freely admitted a probe and the sinus was found to proceed posteriorly, superiorly and slightly to the right for four centimeters from which point the probe could be introduced more anteriorly and medially until a point 8-9 cms. distant was reached. At this point which was just palpable through the anterior rectal wall firm resistance was met. At the point where the tract changed its course the probe detected a rough almost cartilaginous surface. No connection with the rectum was ascertained by probing, proctoscopic examination or palpation. Furthermore, diagnostic fluid injected into the sinus did not come through the rectal wall.

On February 23rd an operation was performed by Dr. George D. Stewart under gas-oxygen anesthesia. After a preliminary injection of the tract with a 5% solution of methylene blue, the sinus was explored with a probe. It was then completely dissected away and excised. The cavity remaining was packed with iodoformized gauze. During the operation it was definitely proven to have no connection with the rectum and to follow the general course described.

The specimen removed consisted of a blueish stained piece of areolar tissue 8 cm. long by 5 cm. wide. One side showed a furrow, probably of the fistulous tract. Microscopical section showed a dense connective tissue which in places was infiltrated with lymphocytes. Pathological diagnosis: chronic productive inflammation.

During the patient's stay in the hospital his urine and blood Wassermann reaction were negative; and his blood picture was also negative with the exception of a hemoglobin percentage of only 75.

The explanation of this unusual sequel to the rupture of an appendix is as follows: Infective material was undoubtedly carried by the middle hemorrhoidal lymphatics to the lower portions of the superior-pelvi-rectal spaces. Here because of a short bending of the lymphatics, a temporary slowing of the stream permits suppuration to progress. The escape downwards of pus from these spaces is of course strongly obstructed by the levator ani muscles and their stout aponeurotic covering. The bulging high up in the rectum was, of course, due to the pressure of the collection of pus. Incision of the bulging wall of the rectum released only a small amount of purulent material. Obviously the evacuation and drainage of the abscess was incomplete and burrowing naturally along the wall of the rectum anteriorly until it spontaneously evacuated in the perineum lateral to the sphincters. Drainage continued for two and a half months through this opening, the upper end gradually filling in, the lower remaining as a discharging sinus. The upper incision left a wound which healed without further delay.

The guiding facts to the diagnosis of such a condition are:

1. A history of previous disease or operation upon pelvic organs.

2. Continued fever and leucocytosis following the correction of such disease.

3. Vague aching or sense of weight in the pelvis or sacral region following abdominal or pelvic disorders.

4. Unexplainable disturbances of bowel function of which the commonest is constipation or similar disturbances of urinary function, commonly evidenced by retention of urine.

5. Definite tumefaction in the wall of the rectum.

Treatment: Treatment should be by an immediate free evacuation made to the side of the rectum on which swelling is felt. This is generally in about a posterior part of the anterior quarter. The initial incision should be made parallel to the fibers of the external sphincter and at right angles to and through the fibers of the levator ani muscle. The deeper part of this incision should be enlarged with care to avoid

injury to important structures. A long drainage tube should be inserted deep into the wound. Loose gauze dressing should be applied and renewed twice daily.

PREOPERATIVE TREATMENT OF PATIENTS WITH EXOPHTHALMIC GOITER. WITH SPECIAL REFERENCE TO LUGOL'S SOLUTION OF IODINE.

ARNOLD S. JACKSON, M.D.,
Section on Surgery, Jackson Clinic,
MADISON, WIS.

The relatively excellent results secured in surgery of the thyroid gland are due to increased vigilance in the preoperative care and the selection of the time of operation rather than the recent development of a brilliant technic in the actual removal of the gland. The greatest recent advance in the treatment of patients with toxic goiter was made during the past year by Plummer who has discovered the efficacy of Lugol's solution in the preoperative treatment of patients with exophthalmic goiter. For a number of years he has been studying various methods in the treatment of goiter, and, as his assistant, I had an opportunity to observe his wonderful work.

During the past six months I have treated preoperatively with Lugol's solution more than thirty patients with exophthalmic goiter. The basal metabolic rate in these patients has been reduced an average of 20 per cent and the clinical improvement was proportional. They became quiet and composed. The starey expression so characteristic of the disease disappeared within twenty-four hours after treatment was instituted. They no longer thrashed about in bed or chafed their extremities until they became inflamed and sore. The irritating skin lesions that sometimes accompany exophthalmic goiter disappeared within a few hours. The heart became quieter and ceased to pound and palpitate and disturb the patient. Exophthalmos, however, persisted until after operation.

Up to a certain point patients show marked improvement. In some cases the basal metabolic rate drops from 60 to 40 per cent with a proportionate improvement in clinical symptoms. As the necessity for ligation is decreased, I frequently perform a primary thyroidectomy, and have not had any instances of postoperative hyperthyroidism. Nevertheless, as Lugol's solution has not been thoroughly tested, I have preferred to remain conservative, and still ligate when in doubt. With experience in the treatment of these patients ligations may undoubtedly be dispensed with in about 75 per cent of the cases. This estimate includes all patients, except those in advanced stages of the disease or those in whom there is a marked cardiac dilatation or renal involvement. In all cases the risk of operation is greatly reduced.

The dosage has not yet been definitely determined. In some cases six drops a day for four days causes marked improvement. In others ten drops a day for ten days does not yield as satisfactory results. Benefit from the treatment is determined by estimates of the basal metabolic rate and observations on clinical improvement. Within certain limits there is marked amelioration of symptoms in most patients.

Lugol's solution is especially valuable in patients who are seen for the first time in a crisis. I have had several such patients and all of them have responded remarkably well to treatment. If the patient is vomiting, it may be necessary to give the Lugol's solution by rectum.

In rather toxic cases I have given ten drops of Lugol's solution every three hours postoperatively until the pulse and temperature remain normal. If the patients are extremely toxic, the dosage may be increased by giving ten drops every hour.

With the exception of digitalis and Lugol's solution drugs are of little value in the preoperative treatment of exophthalmic goiter. We digitalize all patients with exophthalmic goiter who give evidence of cardiac dilatation, myocardial degeneration, or edema of cardiac origin. Tincture of digitalis is given in doses of 1 to 2 c.c. three times a day by mouth, the amount depending on the individual case. The drug is discontinued when the patient complains of nausea and anorexia and before the onset of vomiting. Thirty cubic centimeters is usually sufficient.

The diet should be made up largely of fats and carbohydrates and the patient encouraged to eat as much as or more than he wants. In order to maintain body weight a minimum of 4,000 calories a day should be taken. During a crisis the patient's appetite may be as bizarre as that of a pregnant woman; the mere sight of a hospital tray may induce a spell of vomiting. Special effort should be made to tempt the patient with something that he craves, be it wild cherries or chili con carne.

Vomiting during a crisis cannot be controlled by drugs. A dry diet consisting only of crackers, toast, or bread should be tried, and fluids supplied by rectum or subcutaneously.

Cathartics, except an occasional small dose of magnesium sulphate or one of the mild laxatives, are contraindicated. As the gastro-intestinal tract is al-

ready in an irritated state, diarrhea may be induced by cathartics.

Among the necessary precautions to prevent complications is preoperative examination of the vocal cords which should be done in all cases. If one vocal cord is paralyzed, injury to the other cord at the time of operation will produce serious consequences. The basal metabolic rate, renal function and condition of the heart should be ascertained as well as the blood pressure, pulse rate, and temperature.

Plummer maintains that exophthalmic goiter progresses by a series of waves, or crises, and that operation should never be attempted while on the rise or at the crest of a wave. Crile operates on all patients with exophthalmic goiter one week after they are admitted to the hospital, providing they have been properly digitalized and the renal function is normal. He contends that the disease is in an active progressive state and that the sooner the operation is performed the sooner it will be checked and further damage prevented.

Personal supervision of each patient is essential, as in no other disease is the nervous system so high strung and sensitive as in exophthalmic goiter. After a preliminary rest period, the length of which is governed by the patient's condition and basal metabolic rate, we encourage our patients to be up and around the room a little more each day until their strength will permit them to walk up and down the halls without their becoming exhausted. Because the nervous system is often very much disturbed during menstruation, Crotti considers operation at that time contraindicated.

Undoubtedly, gas-oxygen is the anesthesia of choice in a selected group of cases; the same is true of anoci-association, but probably local procain anesthesia is sufficient in the majority of cases. In the last series of 100 thyroidectomies at the Jackson Clinic local anesthesia was used in 90% of the cases, combined local and gas anesthesia in 5%, gas analgesia in 4%, and ether in 1%. Some surgeons object to the use of atropine because of its inhibiting effect on the depressor nerves of the heart. One hour before operation our patients receive two hypodermatic injections, morphine, gr. ¼, followed in fifteen minutes by scopolamin, gr. 1-300.

If possible, patients with goiter should be operated upon in the early morning before mental fatigue has produced an effect on the body. Patients are not told until the day of operation that the goiter is to be removed. They are thus relieved of spending a night in fear and anxiety.

The fact that there were no cases of post-operative hyperthyroidism in my last series of 100 thyroidectomies argues favorably for the newer methods in the preoperative preparation of patients with toxic goiter.

INDICATIONS FOR RADICAL MASTOID OPERATION.

JAMES MORRISSET SMITH, M.D.,
NEW YORK CITY.

The chronically discharging ear has had a very stormy voyage through the realms of medicine and surgery. For many years it was considered satisfactory so long as the ear continued to discharge; concern was shown only in the event that the discharge materially lessened or stopped. Some of these patients died of "brain fever", (meningitis), but that was considered unavoidable.

In latter years, following the perfection of the simple mastoid operation, various modifications were advocated for the relief of chronically discharging ears, and finally the radical operation was devised.

The peculiarly intricate anatomical structure of the temperal bone, and its intimate relation with the facial nerve, brain and meninges, make this operation a very difficult one.

The results in the beginning were far from satisfactory. There were many injuries to the facial nerve as well as quite a few intracranial complications. This combination of circumstances caused the operation to be looked upon with considerable disfavor, some of the otologists going so far as to state that it should never be attempted. The results now are entirely satisfactory, and when poor, can be directly attributed to inexperience or faulty technic.

The chronically discharging ear represents an infection and does not differ materially from an infection in any other part of the body. Some are operative and some are not. To state that operation is never indicated would be equivalent to saying that an infected leg, gall-bladder or appendix never require surgical intervention.

A continuous foul-smelling discharge, persisting in spite of local treatment, indicates a necrosis of the tissues within the temporal bone. Realizing that this bone lies in the angle between the cerebrum and cerebellum, together with the labyrinth, meninges and other intracranial structures, it can readily be seen why an extensive necrosis may become dangerous to life itself.

It must be determined when this destruction reaches or passes the danger point. In some instances, the problem becomes a most difficult one.

An old ear infection that suddenly flares up with

a high temperature, headache, meningeal or other symptoms of intracranial extension of infection, hardly requires an expert to determine that operation is necessary. Another case may have gone for years with nothing but a slight discharge to indicate the presence of an impending meningitis.

Opinions on a number of old discharging otitides are very apt to differ so that rather than attempt to formulate a definite set of indications, this article will consist of a discussion of the different phases of chronic aural infections, with a view to helping decide what is indicated in the individual case.

In order to facilitate the discussion, cases will be divided into three classes, remembering that there are no distinct lines between them, and that one may readily be converted into the other. They are as follows:

Class 1—Chronically discharging ears in which operation is not indicated.

Class 2—Cases demanding immediate operation.

Class 3—Doubtful cases.

Class 1—Chronically discharging ears in which operation is not indicated. Generally speaking, this type lacks the essential evidence of bone destruction. These cases might well be termed mucous membrane infections. The discharge is largely due to an infection of the mucous membrane of the middle ear and eustachian tube. It is mucoid in character. The foul odor indicative of bone necrosis is missing. Physical examination shows a clean-cut perforation or destruction of the drum membrane. The mucous membrane of the middle ear is free from granulations and polypi, and after the discharge is removed, it usually has a red healthy appearance. The tympanic probe discloses little if any evidence of bare bone. The hearing is usually good. There is nothing to indicate bony destruction in the attic, antrum or mastoid. The discharge is frequently intermittent, recurring with each acute nasopharyngitis. It is entirely possible at any time to have a reinfection with conversion into class two or class three, but unless this occurs, I can see no reason why a mastoid operation should be advised in this class of infections.

Class 2—Cases demanding immediate operation. Here there are symptoms which, experience has taught us, demand immediate exploration, or there is concrete evidence of an intracranial extension of the infection. Included under this heading are cholesteatoma, facial paralysis, subperiosteal abscess, acute exacerbation of a chronic otitis, sagging canal wall and evidence of an intracranial complication.

The large aural clinic will show each year cases of thrombosis of the lateral sinus, brain abscess, labyrinthitis or meningitis due directly to neglect of a chronic ear discharge. I reported 104 mastoid operations performed at the New York Polyclinic Hospital with three deaths.[1] All three were due to neglected chronic otitis, the infection having extended beyond the mastoid before operation. One was a lateral sinus thrombosis followed by double cavernous sinus thrombosis, one a cerebral and the other a cerebellar abscess. A very deporable fact is that many of these cases have been to a number of different ear clinics with nothing advised other than irrigations and alcohol drops.

A cholesteatoma, if allowed to remain undisturbed, slowly but surely enlarges, destroying the bone as well as the soft tissues, and will almost invariably result in an intracranial complication. Its presence alone indicates operation.

Facial paralysis may be the first warning of extensive destruction and demands immediate operation. Careful removal of the diseased bone is usually followed by complete restoration of function.

A subperiosteal abscess indicates a cortical perforation due to either a cholesteatoma or extensive necrosis. An acute exacerbation of a chronic infection is particularly apt to be dangerous and means an additional infection upon an old one or a distinct warning of an extension of the infection beyond the mastoid. Prompt exploration may limit or prevent an ensuing meningitis. A definite sagging of the upper and inner canal wall demands immediate exploration. It is not so common as in the acute infections and is generally due to a cholesteatoma.

High temperature, intense headache, nausea, vomiting, nystagmus, dizziness, stiff neck, occurring separately or collectively, as a result of a chronically diseased ear, warrant an immediate exploration, remembering the importance of a spinal fluid analysis in all cases of meningeal involvement. A negative culture from the spinal fluid means there is still a chance for recovery.

I have just had a case of labyrinthitis and beginning meningitis recover after a labyrinth operation, in which case there was cloudy spinal fluid with a cell count of 18,100 per cu. m.m. The culture from the fluid was negative.

Evidence of a labyrinthine infection demands a radical operation but may or may not require a labyrinth operation.[2] Unfortunately, we are still helpless in the presence of a diffuse meningitis. Nature, however, generally gives warning of the spreading infection. For this reason, immediate exploration is advocated in all cases in class two with the hope of preventing a fatal intracranial complication.

Class 3—Doubtful cases. The doubtful cases have been purposely placed last. They include the chronically discharging ear with few if any symptoms. An intimate knowledge of otitic infections is necessary to pass judgment in a number of such cases. One may have discharged several years and be free from danger, another may be of equal duration and be very dangerous. There are a number of different factors to be considered here since any combination of them may enter the individual case. They are as follows:

History;
Hearing;
Temperature, pain, tenderness;
The presence of polypi or granulations;
X-ray examination;
Bacteriological examination;
Physical examination of the ear;
Character of discharge.

History. In order that the deeper structures of the mastoid become involved, it is necessary that the infection be a severe one, or that the resistance be materially lowered by some concurring infection. For this reason, nearly all of the chronic otitides follow one or another of the severe infectious diseases. The three chief offenders are scarlet fever, diphtheria and measles, with pneumonia, influenza and other infections also playing a part. Scarlet fever probably leads the list. Very frequently cases are seen in adult life with a discharging ear dating back to an attack of scarlet fever in infancy. They are especially apt to be dangerous.

Hearing. In a large majority, the depreciation is due to disturbed conduction, the nerve and inner ear being uninvolved. The hearing is lowered first by the perforation or destruction of the drum membrane, next by necrosis of the ossicular chain, then by the mechanical obstruction due to the granulation tissue. Operation upon a chronic otitis media is advised as a rule on account of the existing danger, however it is true that the average case requiring a radical operation should have improved hearing after the operation. Dr. Dench called attention to this fact some time ago. I presented ten cases after radical operation before the Otological Section of the New York Academy of Medicine, with improved hearing in eight of them.[3]

This result wil be obtained only where a very complete radical operation is done and the skin allowed to grow over the internal wall of the middle ear without granulation tissue. The sounds are then conveyed directly to the inner ear. We may see a dangerous necrosis with very little granulation tissue and good hearing. With an involvement of the nerve or inner ear, it is needless to say that little if any improvement in the hearing can be expected unless it is a serous or circumscribed labyrinthitis.

Presence of polypi or granulations. Does this indicate operation? It is well known that granulations may form very quickly from a small break in the mucous membrane and we have all doubtless seen cessation of ear discharge quickly follow their removal. It would then depend on their origin. If they are recent and coming from a small break in the mucous membrane, especially in the middle ear, a simple removal followed by local treatment will result in a dry ear. If they are long standing and coming from an extensive bone necrosis, a recurrence takes place very quickly and operation is usually necessary.

The question of polyp removal being followed by labyrinthine or meningeal symptoms comes up at this point. Where this occurs, there is a dangerous necrosis already present and the removal is certainly not contraindicated. It should be noted, however, that a radical operation was indicated in the first place. All cases should be kept under close observation following the polyp removal and should any unfavorable symptoms result, immediate surgical relief is indicated.

Fever, pain, tenderness. These symptoms ordinarily do not occur with a chronic ear discharge. Their presence individually or collectively demand immediate investigation. A high temperature in a chronic otitis means either an acute infection added to an old one or a beginning intracranial complication. Pain is usually absent and, if marked, is apt to mean an involvement of the dura, labyrinth or brain. There may be headaches from an ear that is packed with dense granulations. Intense headache, accompanied by insomnia, is suggestive of brain abscess, especially in the cerebellar fossa. Tenderness is absent unless there should be a cortical perforation following a cholesteatoma or extensive destruction of bone. Generally speaking, the occurrence of the above symptoms would indicate the passage of the case into class three, and immediate exploration.

Value of x-ray examination. The *x*-ray is not nearly so helpful here as it is in the acute cases. The chronic inflammation causes the mastoid cells to be replaced with sclerosed bone, the picture resulting in a dense shadow. It may be of service where there is an extensive bony destruction or a large cholesteatoma.

Bacteriological examination. Very little help may be expected here. Both smear and culture show a variety of germs and a predominating organism such as a pneumococcus or streptococcus is found only where there is an acute exacerbation. Occasionally

enough evidence may be found in the smear to make a diagnosis of cholesteatoma.

Physical examination of the ear. After having examined a large number of chronic otitides, one instinctively knows whether or not there is an extensive bony destruction in a given case. However, the complex is not always easy to describe. Where there is extensive bone destruction, the picture is just the reverse of the one described in the mucous membrane infections. Instead of the clean-cut perforation with the mucoid discharge, there is a ragged marginal or complete destruction of the drum. The tympanum contains numerous granulations. There is a partial or complete necrosis of the ossicular chain. The hearing shows depreciation. There is usually a distinct fistulous tract leading upward to the attic and backward to the mastoid. The tympanic probe discloses bare bone. The discharge is dirty, purulent, very foul-smelling, and unchanged by local treatment. The picture, as a whole, is one of bone destruction.

One type particularly insidious and dangerous is very ably described by Whiting. The perforation is usually small and high up, leading into the attic. The discharge is of a dirty grayish color, scant and very foul-smelling. Granulations are not numerous and the hearing is usually good. The necrosis is usually deep seated and inaccessible. Owing to lack of symptoms and scant discharge, it is apt to be overlooked.

Character of the discharge. In the absence of symptoms and a negative or non-productive physical examination, the decision rests largely on the type of discharge and its reaction to careful local treatment. Where the bone involvement is not deep seated or extensive, the reaction to local treatment is favorable. The foul odor disappears and the discharge becomes mucoid or stops entirely. A continued foul-smelling purulent discharge persisting in spite of careful local treatment indicates destruction of bone.

The necrosis is usually situated in the attic, antrum, or mastoid. These areas are very inaccessible and explain the failure of local applications and treatments through the external auditory canal. With persistent evidence of bone destruction, a careful operation is safer than an attempt to forecast the probable course of the infection.

While this article deals with the indications for operation, the question naturally arises as to what results can be expected from the radical operation. With the proper technic, they are excellent. There is either a dry ear or slight mucoid discharge from the tube with danger entirely eliminated.

The argument has been advanced that some of the ears continue to discharge after a radical operation, so why operate? The operation is advised to remove a dangerous necrosis of the bone adjacent to the meninges in the middle and posterior fossa. With the proper technic, this is accomplished. Any remaining discharge is due to failure to permanently close the eustachean tube. The discharge is mucoid and, while annoying, it is not dangerous.

If, after advising a radical operation, the operator finds upon opening the bone that the necrosis is less extensive than was first supposed and especially if the ossicles seem to be intact, a radical operation may be avoided by doing a very complete simple mastoidectomy with a wide opening in the attic, carefully removing the granulations, allowing the ossicles to remain undisturbed, then removing the granulations or polypi from the middle ear through the external auditory canal. A radical operation may be performed later in the event that this is not successful.

The radical operation is primarily indicated in the presence of an extensive and dangerous necrosis and where the proper indications and technic are followed the results will be very gratifying.

REFERENCES.

1. Report of one hundred and four mastoid operations, *New York Medical Journal & Medical Record,* November-December, 1923.
2. Labyrinthine surgery, *New York Medical Journal & Medical Record,* July 19, 1922.
3. Report of ten radical mastoid operations with postoperative hearing and results, *Laryngoscope,* August, 1918.

REPAIR OF THE COMMON BILE DUCT. A CASE REPORT.*

RUSSELL S. FOWLER, M.D., F.A.C.S.
Chief Surgeon, Wyckoff Heights Hospital; Attending Surgeon Methodist Episcopal Hospital, Etc.
BROOKLYN, NEW YORK.

The necessity of repairing the common duct is sufficiently rare to warrant a rather full description of any case in which such a procedure was done.

H. T., female, age 50 years, M. E. H. No. 81,667, admitted January 6, 1921. Past history irrelevant except that twenty years ago she was operated upon by Dr. A. Ross Matheson for gall-bladder disease (cholecystostomy). She had also been operated upon by Dr. Maddren, Sr., many years ago for appendicitis.

Present illness: Eighteen months ago patient had an attack of nausea and vomiting with pain over the entire abdomen, more marked in the right upper quadrant and extending to the back and shoulder. No jaundice. Occasional indigestion. Has had two additional attacks. The pain in the last attack was very severe.

*Read before the Brooklyn Surgical Society, April 6, 1922.

An operation was performed July 31, 1920, by another surgeon. At this operation there were many adhesions between the peritoneum, liver, gall-bladder and transverse colon. Much difficulty was experienced in separating the adhesions. An empyema of the gall-bladder was present. With much difficulty the gall-bladder was separated, the cystic duct exposed and found to contain stones. Stones were also present in the gall-bladder. The gall-bladder and a portion of the cystic duct were removed. Acute inflammation was present involving not only the gall-bladder but the cystic duct itself. The stump of the duct was ligated, and a split tube and cigarette drain introduced.

Three days after operation the compresses were found saturated with green discharge. Two days later the stools were clay colored. This profuse discharge continued and stools remained clay colored until the 23rd day when it was felt an attempt should be made to repair the fistula of the common duct.

Accordingly, on August 22, 1920, the abdomen was opened through the scar of the preceding operation. Many recent adhesions were separated. The fistulous tract was traced to the region of the common duct from which the bile was flowing. The patency of the common duct was demonstrated by passing a probe down into the duodenum and upward in the direction of the hepatic duct. A T-tube was introduced and sutured in place with chromicized "O" sutures. The duct was sutured edge to edge about the tube. Split tube drain and gauze packing introduced. Usual wound closure.

The following day the dressings were saturated with dark greenish-yellow discharge and this saturation of the dressings with bile continued, the stools being light in color.

On the 22nd day following the second operation the tube was tied off. The dressings continued to be saturated with bile and the bowel movements to be clay colored. Each day the tube was clamped off for a while. On the 30th day the tube was clamped off continuously and the patient had a brown evacuation. The discharge from around the tube stopped.

From this time on the patient improved and had bile in the stools. The tube was clamped off from time to time.

The patient was discharged on the 35th day with the T-tube still in place. A few weeks later the tube was removed after having been tied off one or two days at a time without leakage.

On January 6, 1921 she was admitted to my service with the above history. The last operation had been performed six months before. Soon after the final removal of the tube she became jaundiced and has remained so since. Her stools were clay colored, the urine dark. There was persistent pruritis over the entire body. There were no pains.

Operation: January 7, 1921. Right rectus incision. Extensive adhesions involving the liver, colon, omentum, duodenum and stomach, were separated. The common duct was identified at its emergence from the liver. The common duct was represented by a short stump about an inch long and ending in a mass of scar tissue. The duodenum was mobilized and the termination of the common duct in the duodenum identified. The middle portion of the common duct was represented by a mass of scar tissue. The portion of the duct identified as entering the duodenum was about one inch in length. The mass of scar tissue between these two stumps was excised. No connection could be demonstrated between the ends of the duct; the separation between them was about one inch. There had apparently been a sloughing of a part of the common duct. The scar tissue between the stumps was incised in the normal axis of the duct. The floor of these adhesions was not incised. The scar tissue was dissected away from the cut ends of the duct and a T-tube was inserted, one end going well up into the liver and the other going well down into the duodenum. The scar tissue was sewed in two layers over this T-tube to build up a new duct. Cigarette drain. Abdomen closed.

It was not possible to bring the ends of the duct together so that the method used was a method of necessity. We had used the same method before in a case of syphilitic obliteration of a portion of the common duct in which case the method had been successful*. It depends for its success on the artificial duct becoming lined by mucous membrane growing from the cut ends of the ducts along the channel maintained by the T-tube.

The patient vomited bile six hours after the operation. The compresses were saturated with a red discharge but no bile. The first enema given twenty-four hours after operation resulted in a clay colored stool. The cigarette drain was removed on the 6th day; no leakage. The tube drained four or five ounces of bile each day; stools remained clay colored. The jaundice cleared up slowly.

On the 11th day the stool was light brown. There was on this day a moderate amount of leakage about the tube. The average amount drained through the tube was four or five ounces each day. On the 20th day the tube was clamped off two hours, on the 21st day three hours. There was no leakage at any time when the tube was clamped off. The length of the time the tube was clamped off was increased from day to day until finally the tube was clamped off one to three days at a time.

The patient gradually gained her strength; the stools became normal in color; the jaundice cleared.

She was discharged on the 35th day with the T-tube still in place.

Subsequent to her leaving the hospital no drainage occurred except from the tube. This was clamped off for three days at a time, then for five, six and seven days, then for fourteen days, at which time the sinus leaked a little about the tube. The tube was finally removed June 23, 1921, a little over six months from the time of the reparative operation.

The patient was seen April 5, 1922, apparently cured. She had gained fourteen pounds in weight, and had no symptoms of any kind.†

*Syphilis of the gall-bladder and bile ducts, *New York State Journal of Medicine*, October, 1908.

† January 10, 1923. The patient was free from symptoms. She weighed 97 pounds before the operation, and at this date weighed 130 pounds, was in perfect health and was able to eat everything.

American Journal of Surgery
PUBLISHED BY
SURGERY PUBLISHING CO.
Established by J. MacDonald, Jr., M. D.

PUBLICATION OFFICE
STAR-GAZETTE BUILDING, ELMIRA, N. Y.

ADMINISTRATION AND EDITORIAL OFFICE
15 EAST 26TH ST., NEW YORK, U. S. A.
where all communications intended for the Editor, original articles, books for review, exchanges and business letters should be addressed.

SUBSCRIPTION PRICE, TWO DOLLARS
FOREIGN, TWELVE SHILLINGS

Original Articles and Clinical Reports are solicited for publication with the understanding that they are contributed exclusively for this journal.

It is of advantage to submit typewritten manuscript; it avoids errors.

CHANGE OF ADDRESS. Subscribers changing their address *should immediately notify us of their present and past locations. We cannot hold ourselves responsible for non-receipt of the Journal in such cases unless we are thus notified.*

ILLUSTRATIONS. Half-tones, line etchings, and other illustrations will be furnished by the publishers when photographs or drawings are supplied by the author.

SPECIAL NOTICE TO SUBSCRIBERS
The "American Journal of Surgery" is never sent to any subscriber except on a definite written order. Present and prospective readers please note this.

WALTER M. BRICKNER, B.S., M.D., F.A.C.S., *Editor*
New York City

ELMIRA, NEW YORK, DECEMBER, 1923.

MINOR SURGERY: THE TREATMENT OF ABSCESSES.

In a surgical age when the various organs of the body are removed in whole or in part with deftness and comparative impunity, the tendency is to aspire to mere largeness and relegate to insignificance less extensive and less dramatic procedures. From the surgeon, who, for example, has performed hundreds of gastrectomies to the intern who has accomplished a half dozen herniorraphies, there is a tendency to belittle the lesser surgical procedures as "minor surgery." There are operations in this group that require greater judgment and skill than many laparotomies; and medical work in industrial centers, probably more than any other factor, has shown their importance. Kanavel's book on infections of the hand has drawn attention to the tremendous importance of one branch. Possibly if the work and interest applied to major surgical problems were directed into the other field, the returns would be proportionately greater for the human and social economy.

The treatment of abscess, to choose the simplest subject in minor surgery, be it ischiorectal, breast or perineal, can be much bettered. The usual procedure is to incise the abscess, to insert a strip of gauze or a rubber drain, and to dress the wound day after day, while the necrotic wall of the abscess slowly breaks down and daily pours out pus from a dirty wound. Now, the writer has observed that if, after evacuation of pus from the abscess, the cavity is packed so tightly with many pieces of gauze that there appears to be a distention even greater than before the incision was made, in fact so that the part seems almost to burst with the pressure of the gauze, there will remain a clean, red cavity, when the gauze is removed after 48 hours. A small piece of rubber dam may then be inserted merely to keep apart the walls of this clean cavity which goes on to rapid healing without further discharge of pus. The advantage of this method of treatment of abscess over the usual method is striking in economy of time, material, and inconvenience.

Mention of this advance in treatment of a minor condition might almost be considered reducing surgical investigation to absurdity, but it certainly shows that we are in the habit of taking for granted our methods in the smaller cases, and that there is a real need for progress in minor surgery. Indeed, the term *minor surgery* is a misnomer, and individuals and surgical organizations *must* direct more of the attention and research now bountifully applied to major surgical problems to that field.—J. S.

NON-TUBERCULOUS ARTHRITIS OF THE HIP.

In the French, German and English surgical publications there are such frequent references to and so many articles upon the subject of non-tuberculous arthritis of the hip, and in the American literature such scant mention of the disease, that one might draw the erroneous conclusion that it does not occur to any extent in this country.

Froelich of Nancy divides non-tuberculous arthritis of the hip into several groups: (1) a chronic dry affection invading mainly the acetabular cavity which becomes obliterated and causes a subluxation of the femoral head; (2) a progressive necrosis of the acetabular rim by the femoral head which remains intact but becomes subluxated; (3) osteochondritis deformans juvenilis, an affection of the femoral head or epiphysis in young children causing a fragmentation of the femoral head, running a benign course as a rule, called also Perthes', Legg's or Calve's disease, and, (4) a disease of the femoral epiphysis

in older children (12-18) producing an effacement in greater part of the femoral head and a subsequent coxa vara. All these groups have a similar symptomatology with limping, slight fever, coxalgia, adductor muscle spasm, and muscular atrophy. The *x*-ray may be the sole means of differentiation.

Sonntag of Leipzig lays greatest stress on the severer course and end-results and the compensatory lordosis produced by the pelvis on the affected side as it moves with the femur, in tuberculosis. Axhausen of Berlin draws an analogy between osteochondritis deformans juvenilis and Köhler's disease of the tarsal scaphoid bone. Schlatter's disease is probably also quite similar. All these epiphyseal involvements, for such these diseases appear to be, may be due to a low grade infection, although bacteria have rarely been isolated from them and Köhler's disease is regarded by many as a tuberculosis.

Progress in Surgery

Selections from Recent Literature

A Conservative Treatment of Carbuncles. RAYMOND W. LEWIS, New York. *Annals of Surgery,* November, 1923.

Sixteen unselected cases of carbuncles treated by *x*-ray are here reported. Only two of these sixteen cases required operative treatment. Sloughing and suppuration, and the skin sinuses through which this took place, were surprisingly small in the small and moderate sized carbuncles. The very large carbuncles resolved into enormous, sharply demarcated abscesses, which drained satisfactorily through sinuses formed by sloughing of the overlying skin. Pain was relieved following the *x*-ray treatment in the majority of the cases, but this did not occur invariably. The duration of the small and moderate sized carbuncles seemed much shorter with *x*-ray therapy than under operative treatment. The duration of the very large carbuncles seemed about the same with *x*-ray or operative treatment. Cosmetic results of *x*-ray treatment were far superior to those of operation.

The Treatment of Actinomycosis by X-Rays, With a Report of Nine Cases. CECIL P. G. WAKELEY, London, England. *Archives of Radiology and Electrotherapy,* October, 1923.

Treatment should always be combined; it is hopeless to endeavor to treat such a disease by one single method. Excision or scraping of the sinuses, with injection of 2 per cent. iodine in rectified spirit, should be carried out where possible, while large doses of potassium iodide should be given internally. *X*-rays form a very important part in the treatment; the induration around sinuses disappears and scar tissue is often softened remarkably. *X*-ray treatment should be started early and will then be found a very useful adjunct.

Wakeley reports 9 cases. One of the jaw and chin developed epithelioma and erysipelas and died. Three others, of jaw and face, are apparently cured under combined treatment. Another, involving the neck, extended into the lung and caused death.

Two other cases of actinomycosis of the lung both proved fatal.

Two cases of appendicular actinomycosis were both cured; in these cases there can be no doubt that *x*-ray therapy was most beneficial.

The Toxemia of Severe Superficial Burns. BRUCE ROBERTSON and GLADYS L. BOYD, Toronto, Canada. *The Journal of Laboratory and Clinical Medicine,* October, 1923.

Death from burning occurring within the first twenty-four hours is practically always due to primary shock; later than this, it is due to toxic shock.

There is a toxin produced in burned tissue, in larger quantities in skin burns, which circulates in the blood, either in, or absorbed by, the red blood corpuscles, and which causes the symptoms seen in bad superficial burns, and in some cases death.

Extracts of burned skin are toxic. Extracts of skin burned postmortem are innocuous. There is increased protein catabolism in burns as evidenced by the increase in the nonprotein nitrogen and urea nitrogen of the blood. The contents of burn blisters are not toxic. Whole citrated blood from burn cases is toxic. The blood serum is not toxic. Solutions of the corpuscles properly treated are more toxic than whole blood.

The toxic substance consists of two portions, one of which is thermostabile, diffusable and neurotoxic; the other is thermolabile, colloidal and necrotoxic. Chemically the toxin consists of primary and secondary proteoses. No evidence of the production of antibodies against the burn toxin could be found.

Tracheotomy; Improved Technic. ELBYRNE G. GILL, Roanoke, Va. *The Laryngoscope,* October, 1923.

Complications can be avoided and haste in performing the operation can be obviated by first introducing a bronchoscope, allowing it to remain in the trachea and bronchus until the operation has been completed.

When the bronchoscope is once introduced there will be no need for undue haste in performing the tracheotomy as the patient will have been provided ample breathing space and the operator will have a firm land mark to follow in cutting down on the tracheal rings. After the incision has been made through the tracheal rings and all bleeding controlled, remove the bronchoscope to the point of the incision and introduce the tracheal cannula. The incision should be made low, following the method described by Jackson. If this is done a tracheotomy will be performed and not a laryngotomy.

X-Ray Therapy in Chronic Tonsillitis. J. W. BABCOCK, New York. *The Laryngoscope,* October, 1023.

In the cases observed, *x*-ray therapy in chronic disease of the lymphoid tissue of the pharynx and naso-pharynx, does not cause a disappearance or fibrosis of this tissue, it does not render the crypts of the tonsil free from pathogenic bacteria, it does not relieve the patient of acute local inflammation or the more remote symptoms due to absorption of toxins or bacteria from the tissue in question. Therefore since it does not accomplish the effects desired, it cannot take the place of adequate surgical treatment of this diseased organ, although we must concede that its ease, painlessness and freedom from the dangers of surgery must have proved very alluring to those who undertook its investigation.

The Use of Gentian Violet in the Treatment of Empyema. ROBERT C. DAVIS, Rosedale, Kansas. *The American Journal of the Medical Sciences,* November, 1923.

All cases in which a seropurulent exudate in which there are organisms are treated. In all of the cases with seropurulent exudate organisms were found. The chest over the fluid area is anesthetized with 0.5% novocaine. The aspiration is done with a 50-cc Luer syringe connected to the needle by a piece of rubber tubing two to three inches in length with adaptors to fit syringe and needle. This prevents air entering the chest at the time of disconnecting syringe and needle and also is not likely to injure the visceral pleura and the lung by movements of the patient or by connecting and disconnecting the syringe. An assistant maintains the position of the needle. The fluid is aspirated until the cavity is almost dry, this to be determined by the patient beginning to cough. One precaution observed is that during the first aspiration if there is a large amount of fluid, Davis did not take out an unnecessarily large amount, although he

never saw any bad results from slow aspiration. Then one-half as much warmed aqueous solution of gentian violet (1:2500) as fluid removed is slowly injected into the cavity. This solution is allowed to remain until the next aspiration which should be in from one to five days, depending upon each individual case. During the second and following aspiration a solution of 1:1000 is used. In all there were treated 18 cases of empyema. In none of these was a rib resection done, all clearing up with the use of gentian violet. Fifteen cases were treated while the disease was in the seropurulent and early purulent stage. In the 3 cases which had organization of the exudate 0.25 to 0.5 of 1% chlorazene in small amounts was injected to dissolve the exudate. The method can be used successfully both on the early and late cases, but is especially advised on the acute cases of empyema before encapsulation and while pneumonia is still present.

Abdominal Surgery Without Detached Pads and Sponges. H. S. CROSSEN, St. Louis. *The Journal of the A. M. A.*, November 10, 1923.

The essential feature of Crossen's method is the substitution of a long gauze strip for the ordinary detached sponges, the greater part of the strip being always outside the abdominal cavity. The strip is 10 yards long. Two strips are made by dividing the yard-width of gauze in the center and folding each half longitudinally to six thicknesses. Each strip is therefore 10 yards long, about 3 inches wide, and has six thicknesses of gauze. For protection and convenience in handling the strip is packed into a small muslin bag, 5 inches wide and 10 inches deep. The end of the strip is stitched to the bottom of the bag, and the strip is then packed into the bag in such a way that it may be pulled out a little at a time, as needed. The filled bags are sterilized and are then ready for use. At operation, the bottom of the bag is clamped or pinned to the abdominal sheet, and the gauze strip is pulled out a little at a time as needed for sponging.

Recurrent Appendicitis. (*Über die chronisch-rezidivierende Appendicitis.*) E. LIEK, Danzig. *Archiv für Klinische Chirurgie*, September 22, 1923.

"Chronic appendicitis" is a purely anatomic term and clinically it is a misnomer. Rather we should use the expression chronically recurrent appendicitis, for the disease manifests itself not in a continuous process, but by a succession of attacks, each one of which leaves its scar. Usually the so-called chronic appendicitis is not an affection of the appendix, but of some other abdominal organ or it may be a psychic affair.

It is astonishing how frequently appendicitis occurs, how little trouble it may cause the patient, and how often it disappears without leaving a trace of its visit. Autopsy material demonstrates that almost everyone who has reached late adult life has had some pathological change in the appendix, however mild. This observation is similar to Naegeli's in regard to the frequency of anatomical (though not necessarily clinical) lesions in tuberculosis.

Appendicectomy should not be performed in the cases of so-called chronic appendicitis, but should be reserved for those cases in which there have been recurrent attacks. The post-operative results in cases of operation for "chronic appendicitis" even in the hands of such an excellent surgeon as Haberer have been quite disappointing, while the results in the cases of true recurrent attacks have been very gratifying.

The Cause of Recurrence of Symptoms After the Removal of Appendix. CHARLES H. LAWRENCE, Boston. *The Boston Medical and Surgical Journal*, November 8, 1923.

This paper is based on 97 cases showing the symptoms of intermittent pain in the right lower quadrant, vomiting, nausea, and disturbance of the function of the bowels over a period of a year or more. Of these cases, 50 have had either operation or an *x*-ray study, so that the intraabdominal condition is definitely known in each.

Of these 50 cases, 21, or 42 per cent., have been operated on because of the diagnosis of chronic appendicitis. Of the 21 cases operated on, none was completely relieved by the operation. Seven, or one-third of those who had the appendix removed, have obtained partial or temporary relief.

Of a group of 41 cases, 15 showed incompetent ileo-cecal valves; of the others, three cases showed diverticula of the large bowel, three showed definite adhesions involving the bowel, and one case showed a questionable duodenal ulcer as the probable cause of the symptoms.

The typical patient with the "chronic appendix" is of the thin, small-waisted type in which the upper abdomen offers insufficient room for the organs which should normally be found there. Usually there is a definite though moderate anemia. The skin is often sallow. The tongue is generally coated. Three patients in the series were troubled by attacks of severe urticaria though no food sensitization could be discovered. In short, the patient exhibits a picture of probable ptosis, constipation, and absorption from the intestinal tract.

Examination of the abdomen will usually show that the region of the cecum is only moderately tender, that pressure in that region causes a great deal of gurgling, and the cecum itself can often be palpated. Spasm of the abdominal muscles is, as a rule, absent, and if present is slight in amount. Pressure over the cecum often gives rise to nausea or epigastric discomfort, and this is particularly true in those patients who have incompetent ileo-cecal valves. It is an interesting question as to whether regurgitation through the ileo-cecal valve is not an important factor in the production of nausea and vomiting in these cases.

In the treatment of these patients, the first step is the regulation of the bowels. For this purpose an increased fluid intake, the increased ingestion of fruit and, as a usual thing, increased exercise are of value. The use of liquid petroleum is in most cases a distinct help, for it minimizes the amount of other laxative which may be necessary. The dose should be that amount which can be taken without leakage. If there is spasm of the bowel, or if there is incompetence of the ileo-cecal valve, atropin or belladonna will usually give relief.

The majority of these patients eat too little rather than too much, and should be encouraged to increase and diversify their diets, avoiding only those things which experience has taught them are certain to cause distress.

General exercise is of value in building up the tone, not only of the skeletal but also of the intestinal muscle. Care must be taken, however, to avoid fatiguing the patient by corrective exercises or any other form of energy expenditure. Fatigue, whether from physical or mental overactivity, is an important factor in producing intestinal stasis, and in many cases, rest is, at first more valuable than exercise.

Over 50 per cent. of the patients have been greatly improved by medical treatment and are comfortable so long as they take care of themselves.

If operation be necessary, it should comprise not only removal of the appendix, but of any other condition which may be found to be interfering with normal intestinal function. Complete relief, without further treatment, should not be promised, and operation for "chronic appendicitis" should not be advised until the value of medical treatment has been determined.

A Study of One Thousand Consecutive Cases Presenting Gastro-Intestinal Symptoms. HUGH S. WILLSON, Minneapolis, Minn. *The Journal-Lancet*, October 15, 1923.

The author draws the following conclusions from his study of 1,000 cases:

A very high proportion of patients with gastro-intestinal symptoms, notwithstanding obscure histories and findings, are suffering from the most commonly known ailments.

So-called neurasthenics require an exhaustive study, as there is usually an organic reason for their trouble.

Chronic gall-bladder and appendicial conditions rank higher in frequency as the cause of indigestion or dyspepsia than do organic diseases of the stomach or duodenum.

Chronic cholecystitis with hepatitis is of frequent occurrence in young adults.

Duodenal ulcer is the most frequent direct organic disease of the stomach and duodenum, and is often difficult to differentiate from diseased gall-bladder.

Gastro-intestinal symptoms may be reflex from nearly

any disease to which the human flesh is heir.

A careful history and physical examination are of primary importance in arriving at a correct diagnosis.

Acute Dilatation of the Stomach. (*Zur Kasuistik der akuten Magendilatation*). R. GIRGENSOHN, Riga. *Archiv für Klinische Chirurgie*, September 22, 1923.

Gastric paralysis may occur immediately after operation or be delayed until the third to fourteenth day. The operation may be of any variety, or dilatation may take place without operation, as in typhoid, or after the rapid ingestion of a heavy meal followed by trauma. The etiological factor is probably a discord between a vague paralysis and a sympathetic nerve stimulation, and pressure on the mesenteric root and arterio-mesenteric ileus are of minor importance. Pelvoperitoneal exudate, ileus high up following hernia, peritonitis, uremia, twisted ovarian cyst, and intra-abdominal incarcerations have all caused confusion in diagnosis. Death occurs in 50% of the cases due to loss of fluids, retention of toxic products, cardiac compression, and occasionally gangrene of the stomach.

Treatment as far as the operative cause is concerned should depend mainly on prophylaxis anesthesia and in the preparation of the patient. Active measures consist of stomach lavage, knee-chest or right-side posture, and operation by means of gastrostomy, gastroenterostomy, jejunostomy, duodeno-jejunostomy, and puncturing of the stomach and emptying its contents.

Acute duodenal closure caused by scar tissue and omental strands or other means of pressure on the duodenum usually after gastric operations must be differentiated from acute dilatation of the stomach. The principal points in diagnosis of the former condition are cramp-like pain in the epigastrium and peristalsis of "gastric motor unrest," but if the attempts of the stomach to overcome duodenal obstruction persist, it may result in gastric atony.

An Inquiry Into the Usefulness of the Duodenal Tube. MANLY FINKELSTEIN, Winnipeg, Manitoba. *Surgery, Gynecology and Obstetrics*, November, 1923.

In this investigation 500 cases have been studied. Duodenal drainage is a helpful clinical method in the diagnosis and treatment of early diseases of the biliary system. Cases of suspected gall-bladder lesions that have come to operation have had the preoperative duodenal drainage diagnosis definitely confirmed.

The method presents an important means of determining the presence of parasites and their ova or focal infection of the biliary tract, conditions which may be of the greatest diagnostic and therapeutic value in obscure conditions, such as arthritis, neuritis, etc.

Therapeutically, the method has proved to be extremely valuable in the early stages of catarrh and infection of the biliary tract, biliary stasis, chronic biliousness, and severe migraine. The duodenal tube cannot supplant surgery, where gross pathological lesions exist, such as cholelithiasis, empyema of the gall-bladder with cystic duct obstruction or gangrene of the gall-bladder, but where surgical interference is contraindicated, because of a heart or kidney complication, the tube offers an alternative which in not a few cases affords much relief. In cholecystectomized patients who still complain of trouble in the right hypochondrium, the tube has been very useful in clearing up the stasis and infection, which could not be treated surgically.

Cholelithiasis. H. F. O. HABERLAND, Köln. *Archiv für Klinische Chirurgie*, September 22, 1923.

The developments in theory and practice in gall stone disease are reviewed at great length. The author is of the opinion that infection is the cardinal factor in cholelithiasis, stasis secondary. Bacteria have been isolated by various workers in from 40% to 85% of cases, and even the absence of bacteria does not speak against an infective etiology. A very important mode of infection in addition to the hematogenous, is from the intestines by way of the portal vein, lymphatics, and direct extension. Observations in lower animals have revealed many kinds of foreign bodies that have wandered in from the duodenum. Pregnancy is an exception to the theory of infection in that the concomitant hypercholesterinemia is a more important factor.

Gall stones occur more often in vegetarians than in meat eaters, but not more often in the obese than in others. Cholelithiasis without symptoms is not uncommon, occurring in autopsies in from 0.5% to 12%. Therapy is surgical and the operation of choice is cholecystectomy with drainage. The causes of post-operative biliary fistula are incompetence of the cystic duct ligature, leakage through the common duct after hepatic duct drainage, injury to ducts not noticed during an "ectomy", stones allowed to remain in place, and stricture formation in the common duct.

A Biological Consideration of Abdominal Hernia. G. PAUL LAROQUE, Richmond, Va. *International Clinics*, Vol. III, Series 33, 1923.

In a well-marshalled array of morphologic, biologic and clinical considerations LaRoque supports the validity of the congenital origin of sacular theory of abdominal herniæ, and shows the inacceptability of muscular strains and efforts as causes. He says belief in the pouch- and weak-spot-producing effect of sudden abdominal contraction by coughing, sneezing, straining, lifting and the like, is sleeping quietly under the sedative influence of its own weakness. The theory of intraabdominal pressure as a cause is incompatible with the sacular conception of hernia. Intra-intestinal pressure is not charged with the causation of Meckel's or other bowel diverticula. The genesis of these and of the lesser peritoneal cavity and various pockets of peritoneum throughout the greater cavity and of all other anatomic formations is to be sought through a study of morphology, *i.e.*, biology, clearly independent of any forces but those of growth.

Spontaneous closure of wide open umbilical and inguinal orifices and obliteration of hernial sacs in these locations in spite of abdominal pressure is so well known that operation upon young children for uncomplicated inguinal and umbilical hernia is seldom advised. The laws of biology explain closure of hernial orifices as the result of the stimulative effect of abdominal tension and local pressure upon growth of fascial fibrous tissue.

Complete and permanent cure of hernia follows complete removal of the sac with the adjacent redundant peritoneum and proper repair of the abdominal wall with uniform regularity and in spite of vomiting, coughing and straining effort.

Hernia has not resulted experimentally even after leaving a hole in the abdominal wall down to but not through the peritoneum.

We will do well to dismiss from our minds the conception of a congenital formation or malformation as one which necessarily exists at the time of birth. The laws of biology recognize no time limit upon their operations, exhibit no diminution in their activity following expulsion of the new-born from the body of its mother, but continue to operate as long as there is life. Pre-natal and post-natal growth is governed by the same biological laws. No one denies that the teeth, cranial sutures and many other formations are congenital, though teeth are seldom and cranial sutures never present at birth. Direct inguinal, femoral, obturator and certain other rare hernial sacs are post-natal results of imperfect development and fusion of fascia, incomplete structural adaptation. They are congenital acquisitions, products of imperfect correlation of growth of fascia and peritoneum.

Every abdominal hernia is a definite structural product of growth. Indirect inguinal, umbilical, epigastric and diaphragmatic hernial sacs and orifices are pre-natal formations; direct inguinal, femoral, obturator and other parietal herniæ are post-natal developments; all herniæ are congenital morphological products.

The genesis of the orifice and sac of hernia is totally independent of trauma either from without in the form of external injury, or from within in the form of forcible contact of the abdominal wall and internal organs resulting from sudden contraction of the abdominal wall or of intra-abdominal distention.

Recurrence of Inguinal Hernia After Operative Treatment. ALBERT S. MORROW, New York. *Annals of Surgery*, October, 1923.

Oblique and direct hernia should be looked upon as two distinct conditions, in both of which recurrence is probably more frequent than was formerly recognized—this being

especially true of the direct form.

Improvement in operative results is not likely to come from the development of an operation based upon new principles, but in the elimination of what are considered to be frequent causes of failure to obtain a permanent cure:

(1) Subjecting to operation patients in whom, on account of the type of hernia, and the condition of the parts that must be utilized for repair, there is small chance of obtaining a permanent cure.

(2) The use of an operation which, while adequate in some cases, fails to meet the indications in an individual case.

(3) The failure to thoroughly remove the sac or to recognize and remove a double sac.

(4) Repair of the canal under tension.

(5) Injury to the nerve supply of the inguinal region.

(6) Infection.

(7) Separation of the repaired structures from a failure of the sutures to hold, or from the strain of post-operative vomiting.

A Clinical Study of Radium Therapy in Carcinoma of the Rectum. HOWARD A. KELLY and GRANT E. WARD, Baltimore, Md. *Surgery, Gynecology and Obstetrics,* November, 1923.

In this series radium therapy has been helpful in obtaining 11% cure and a 62.5% palliation of all cases in the series of 200 suffering from carcinoma of the rectum. Of 94 cases treated by radium alone 8 are well.

Radium used alone or with some operative procedure is par excellence the most valuable therapeutic agent in the treatment of cancer of the rectum in all stages. In the hopeless group radium is valuable in giving relief to various symptoms and affording comfort for the remainder of life. There are a number (27% of the total) who did not respond and these are termed for the present as not "radiosensitive." In this group the tumor was fixed in 40%, and practically all were well advanced. The one way to determine the radio-sensitiveness of a tumor is a substantial treatment followed by careful observation; in other words, the great benefits to be expected from radium justify its trial in every case of cancer of the rectum. The implantation of needle points alone, or combined with other methods, will yield the highest percentage of improvement and of cures. Whether by radium alone or in combination with operation and colostomy, a combination of external and internal application gives the highest percentage of palliation, while the radical operation plus external treatment yields the highest percentage of well patients, namely 32%, and external treatment in cases where there was no operation gave a cure of 11.1%.

The procedure in treating a case as indicated by these results would be: (1) If the case is operable, radiate and operate, there being little choice which should be done first, but especially radiate externally. If all the growth cannot be removed, either treat internally as well as externally or implant bare glass needle points if sufficient growth remains after the operation. This can be done at the operation. (2) If inoperable or a border-line case, treat heavily with external and internal radiation and implant in the hope of bringing the tumor to an operable size or causing it to disappear entirely. If it becomes operable, operate and radiate again, if necessary. If there is postoperative recurrence, radium offers excellent palliation and a good chance to cure. Of all the well cases, 9.9% were recurrent after previous operations. (3) If on admission there is obstruction, a colostomy should be done; however, it does not seem wise to do a colostomy as a routine or even as an expedient measure unless there is obstruction.

The Use of Fat to Prevent Sutures Cutting Into Parenchymatous Organs by Underpinning. With Special Reference to the Suture of Nephrotomized Kidneys. EDWIN BEER, New York. *Surgery, Gynecology and Obstetrics,* November, 1923.

To close an incision in the kidney, spleen or liver, some fat from the adjacent wound is excised and cut into fair-sized masses. A fairly heavy chromic stitch with the two ends of the stitch tied together is passed deeply through the part to be sutured, so that organ has a double thread of chromic gut running through it. Before pulling the loop up to the organ that is being sutured, one piece of fat is slipped under the loop and then the suture is drawn tight. On the other side of the organ where the needle has been brought out, between the two loops of chromic gut, another piece of fat is placed and over this the two ends of chromic gut are tied after removing the needle. This knot can be pulled up as tight as required to control the bleeding, and as the stitch is underpinned on both sides, there is very little chance to cut into the parenchyma. No tissue is throttled by the passage of the suture, as is the case in mattress sutures.

Renal Tuberculosis Simulating Nephrolithiasis. (*Tuberculose rénale à forme pseudo—lithiasique.*) R. LANZILLOTTA, *Journal d'Urologie,* September, 1923.

There is a form of renal tuberculosis which clinically cannot be distinguished from nephrolithiasis. Patients have more or less severe recurrent attacks of pain like renal colic, with or without bladder disturbances, which yield to the same form of treatment as stone. Even the roentgengram may confirm the diagnosis of calculus because of a shadow cast by a concretion of caseous débris. The migration of the débris may be the cause of pain, the presence of which contradicts the aphorism that the absence of pain constitutes one of the best signs of the probability of renal tuberculosis. This form of renal tuberculosis, since it probably is not recognized as such, is more frequent than is commonly thought, and the only means of establishing an exact diagnosis may be in the chemical and bacteriological examination of the urine obtained on ureteral catheterization. Seven cases observed by the author are described.

The Incidence of Malignant Disease in the Apparently Benign Enlargement of the Prostate. R. H. JOCELYN SWAN, London England. *The Lancet,* November, 1923.

In many cases of prostatectomy the macroscopic appearance of the gland removed gives rise to no suggestion of malignancy. In Swan's cases four in a total of 28 consecutive prostatectomies, or roughly 14 per cent, were found carcinomatous. In a series of 678 prostates removed by operation and submitted to Dr. Eastes and Dr. C. Fletcher for pathological examination during the last ten years, no less than 174, or 25.7 per cent., were definitely malignant, whilst they classify 58 others, or 8.6 per cent., as borderline or pre-cancerous; 443 or 65.3 per cent., were innocent (adenomatous), and 3, or 0.4 per cent., were tuberculous.

The findings, however, must be discounted to some extent by the fact that many surgeons send for examination only those prostates about which they themselves have doubt and destroy the others.

The Significance of Inflammatory Ureteral Strictures in the Female. THOMAS H. CHERRY, New York. *New York Medical Journal and Medical Record,* November 7, 1923.

Ureteral stricture in the female, of the nonobstructive type, is a much more frequent entity than is generally recognized. In view of this frequency we should investigate thoroughly the urinary tract of gynecological patients who complain of urinary symptoms.

The etiology of this condition is a transmission of a low grade infection through the medium of the periureteral lymphatics communicating with those of the adnexa, uterus, broad ligament and endocervix.

Gradual bougie dilatation is the treatment of choice and good results can be expected in the nonobstructive type.

In the obstructive type of stricture, with marked kidney infection and poor renal function, ureteral dilatation should be given a trial before more radical measures are instituted.

An Analysis of Twenty-Six Extrauterine Pregnancies. CHARLES MAZER, Philadelphia. *New York Medical Journal and Medical Record,* November 7, 1923.

Primary sterility is not an important factor in the etiology of ectopic gestation. Abortion, especially induced abortion, is a potent factor in the causation. Only 33% present the classical symptoms of rupture.

Exquisite sensitiveness of the unruptured tube furnishes

the most valuable sign of ectopic pregnancy. A rapid increase in size of a tuboovarian mass, coupled with marked tenderness, is pathognomonic of extrauterine pregnancy.

Exploratory curettage may be of value in diagnosis; and frequent blood examinations may be of some value in cases of slow bleeding. Operate immediately and combat shock by intravenous injections of salt solution and blood transfusion.

The Diagnostic Value of the X-Ray in Obstetrics. ALEXANDER M. CAMPBELL and PAUL WINTER WILLITS, Grand Rapids, Mich. *The Journal of the Michigan State Medical Society,* November, 1923.

This paper emphasizes that the *x*-ray is of real value as a diagnostic aid in obstetrics, and urges practitioners to avail themselves of this adjuvant.

The difficult part of obtaining satisfactory photographs of the fetus in utero are numerous. The fetus is a movable body and the picture must be taken with the object some distance from the plate. The abdominal wall and the bony parts of the pelvis make this work very difficult; furthermore, it is difficult for the pregnant woman, when the pregnancy is advanced, to assume the proper positions necessary to obtain a good picture, and it is almost impossible for the pregnant woman, especially when she is nearing full term, to hold her breath, which is so necessary in this work. The Potter-Buckey diaphragm has been of great benefit and recently a superspeed film has facilitated this work.

The greatest value of the *x*-ray as a diagnostic aid in obstetrics is in the determination of abnormalities, such as anencephaly, hydrocephaly, multiple pregnancy, pseudocyesis, deformities and growths of the bony pelvis, and especially in the detection of the finer defects which produce fetal and maternal dystocias which are unrecognizable by any other method.

There seems to be no danger to the fetus in a diagnostic irradiation under proper technic, but Campbell and Willets advise against repeating it any oftener than is necessary.

The Pathology and Treatment of Chronic Leucorrhea. A Further Clinical and Laboratory Study of this Subject. ARTHUR H. CURIS, Chicago. *Surgery, Gynecology and Obstetrics,* November, 1923.

The sources of chronic purulent leucorrhea can usually be definitely localized. These foci of infection are important factors in the production of systemic disturbances, as well as local distress.

Cervical discharges may persist after disappearance of infection; this is notably true if extensive hyperplasia of the cervical glands has occurred. Relief from these innocent discharges is not essential, provided they cause no remedial annoyance.

Available measures in the control of chronic leucorrhea consist in eradication of gland infection in the vicinity of the urethra, dilatation of cervical strictures, and destruction of hyperplastic glandular tissues by endocervix removal or through the use of radium.

Destruction of infected Skene's ducts and urethral glands, together with thorough dilatation and radium treatment of the cervix, has been followed by recovery from chronic leucorrhea in 87% of 104 patients.

Pus in the Pelvis of Women. G. PAUL LAROQUE, Richmond, Va. *New York Medical Journal and Medical Record,* November 7, 1923.

Many women acutely sick with suppurative disease of the uterus and tubes recover almost completely without surgical operation. Recovery is hastened by vigorous nonoperative treatment of peritonitis, i. e., ample quantities of morphine and other opiates; local hot or cold applications to the abdomen; absolute and continuous rest; abundance of fresh air through open windows; gastric lavage when vomiting is persistent, restriction of solid food; avoidance of cathartics and enemas; administration of large quantities of water (at least four quarts daily), preferably by mouth; normal saline solution by hypodermoclysis, in certain cases by enteroclysis, and in severe cases by all these routes combined.

Immediate operation is never called for; emergency operation should never be performed; every case may without danger wait for operation until at least partial subsidence of fever and pain, flattening and pacification of the acutely sick abdomen; acquisition of some degree of systemic immunity and transportation to a modern hospital; few cases need wait much longer than this. The records show that reasonably early operation is preventive surgery against long preoperative and postoperative invalidism, against extension of disease to the other tube and one or both ovaries, against dense adhesions and ulceration of the bowel; and prevents the necessity of mutilating operations upon the pelvic organs, reparative operations upon the bowels, and of an unnecessary proportion of cases of drainage.

Systematic and thorough operative procedures are called for; all disease should be cured at one operation in approximately ninety-five per cent. of cases. No normal tube or ovary should be removed; no diseased one should be preserved. Mortality is lower, convalescence smoother, and cure more complete following complete than incomplete removal of disease.

Abdominal drainage following removal of diseased tissue is necessary in less than 25% of 170 women with pelvic abscess and in less than 10% of the total number of 500 women in this series.

Postoperative treatment is the same as that for peritonitis; rest, abundant quantities of morphine, normal saline solution by hypodermoclysis, water or soda solution by enteroclysis, at least four to six quarts of water by mouth each twenty-four hours for four or five days, hot or cold refreshing liquid food and beverages when the stomach becomes retentive, gastric lavage for bilious vomiting and the rigid avoidance of drugs, enemas, rectal tubes, solid food and other such stimulants to peristalsis until the abdomen becomes flat, and the patient passes flatus (usually from four to five days or a week depending upon the severity of the disease).

The mortality of suppurative disease following operation should not be more than one per cent., the stay in bed rarely longer than two weeks, there should be no excessive postoperative menstruation, no pelvic pain nor purulent discharge

Arthroplasty. ERNEST W. HEY GROVES, Bristol. *The British Journal of Surgery,* October, 1923.

The problem of arthroplasty lies in the judicious combination of mobility with stability. It is unjustifiable deliberately to produce a flail-joint or to employ such a wide excision as will probably give rise to it. On the other hand, it is as well to err on the side of over-mobility, because the range of movement usually becomes less with the lapse of time; and in the case of the knee-joint it is quite possible to reconstruct the main ligaments of the joint by a later operation if the stability has been seriously compromised. This would seem to be a wiser course than that of attempting to construct new ligaments at the time of the main operation. Not only would this unduly prolong the operation, but it would tend to prevent the early achievement of the full movement desired.

Among twenty-one British surgeons during the past five years, the chances of a stiff elbow being made functionally good have been about even with the chances of failure, whereas with the hip and with the knee the chances of improvement have been much less, only about 1 in 4 or 5. Two facts seem to be proved beyond all doubt. The first is that arthroplasty is capable of producing almost perfect functional joints in the case of the elbow and knee. The second is that the attainment of this perfect result is the exception and not the rule.

Clinical evidence as to the result of arthroplasty is conflicting. There is ample evidence that operative mobilization of the elbow is usually followed by greatly improved function. Arthroplasties for the hip and knee often lead to disappointment or failure. The condition most favorable for arthroplasty is bony ankylosis due to trauma or pyemia which has long been cured. Certain cases of tubercle and osteo-arthritis also give good results. The essential act in arthroplasty is to make a gap between the articular ends and to maintain this gap whilst healing takes places. Shaping and covering the articular ends are useful, but not essential. Continuous traction on the new articulation and early voluntary movements are the essentials of after-treatment.

In the elbow, the indications include all cases of bony

ankylosis free from active infection, except those in which a strong, useful arm is present in a laboring man. The best operation for the elbow is to preserve the whole width of the humeral condyles and to cover this bone with a free flap of fascia lata.

In the hip, three different types of operation must be considered. For simple ankylosis, an osteotomy of the neck of the femur with interposition of a flap taken from the trochanter or from the capsule. For massive hypertrophic ankylosis, a subtrochanteric osteotomy with the interposition of a fascial flap, forming a saddle-shaped joint. For osteoarthritis, excision of the head of the femur.

In the knee, the importance of stability and painlessness makes any mobilizing operation unjustifiable if the joint is fixed in a good position. It is only in the case of ankylosis of both knees that arthroplasty is to be considered. The use of free fascia to cover the lower end of the femur, the preservation of the lateral ligaments, and the use of a jointed knee-cage for some months after operation, are the special points on which stress must be laid. If lateral mobility persists, then the lateral and crucial ligaments must be reinforced by a second operation.

Synovectomy of the Knee Joint in Chronic Arthritis. ELLIS JONES, Los Angeles. *The Journal of the A. M. A.*, November 10, 1923.

Jones reports twelve cases of chronic arthritis of the knee joint in which the synovial membrane was dense and thickened, and in which there was evidence of trauma in almost every joint. In several cases, extensive erosion of the articular surfaces of the condyles was present, the articular surface of the tibia being relatively smooth. Adhesions were commonly found between the synovial folds in the lateral culdesacs of the superior joint. Synovial fringes, fibrillation and derangement of the menisci together with hypertrophy of the alar ligaments and retropatellar pad, were almost constant findings. Pathologic reports showed chronic inflammatory tissue. Cultures were negative, and micro-organisms absent in stained specimens. Restoration of painless function occurred in every case after a synovectomy was performed. Relapse occurred in one case, badly selected, and recovery followed appropriate antisyphilitic treatment. Although synovectomy in the treatment of the chronic knee joint has distinct value, it must be definitely recognized that its application is limited and must be largely directed to the relief of a disabling condition only after persistent conservative methods have failed. Jones uses the split-patella approach of Robert Jones, pioneer in this operation.

Bone Tumors, Benign Bone Cysts Due to Central Ostitis Fibrosa of the Unhealed Latent Type. With Discussion of the Operative Treatment, Especially the Crushing of the Cyst Wall. JOSEPH BLOODGOOD, Baltimore. *The Journal of Radiology*, October, 1923.

The healing of a bone cyst in which there has been a fracture of very slight degree is usually not complete for two to four years. If accidental refracture takes place the rapidity of healing is increased. If the fracture is comminuted, complete ossification is as rapid as in the normal bone. The rapidity, therefore, of complete ossification in the ordinary bone cyst after fracture is largely influenced by the extent of the fracture.

There are numerous observations which lead to the practical and definite conclusion that the best treatment for a bone cyst is a comminuted fracture (crushing the bone shell). If ossification is not rapid after the first fracture much time will be saved by an operation.

When the *x*-ray shows a bone cyst without fracture, and subsequent *x*-ray examinations demonstrate slow or imperfect ossification, operation is indicated. The chief danger of not operating upon a bone cyst which is not ossifying is that it may reach great size and convert a simple operation into a difficult and sometimes dangerous one.

In addition, it is more difficult in the big bone cyst to restore the continuity of the bone to normal; there are very apt to be bending deformities very difficult to correct.

In a third type of bone cysts the patient's age is over fifteen, and for this reason other types of central bone lesions cannot be excluded. If it is associated with a fracture of some extent, there seems to be no danger from the postponement of the operation which will be avoided if complete ossification is observed in the *x*-rays. But in the absence of fracture or if ossification is tardy or does not occur, operation is indicated. If a bone cyst is revealed nothing has been lost; if the tumor proves to be a benign giant-cell growth, or a chondroma, myxoma or sarcoma, no time has been lost in instituting the proper operative treatment.

Bloodgood reports several cases and describes the technic of the crushing of the bone shell in the operation for benign bone cysts.

Tuberculous Tenosynovitis of the Hand. A Report of 14 Cases of Tuberculous Tenosynovitis. ALLEN B. KANAVEL, Chicago. *Surgery, Gynecology and Obstetrics*, November, 1923.

After discussing etiology, pathology and symptomatology Kanavel says tuberculosis of the tendon sheaths, if unaccompanied by active lesions elsewhere, is probably one of the least difficult tuberculous processes in which to obtain complete cure. This may be secured either by conservative treatment such as removal of the melon seeds, injection of iodoform emulsion, and immobilization by splinting for a considerable period, or by complete surgical removal. The former method requires considerable time for its application, with consequent loss of use of the hand.

In his earlier cases, the first method was utilized, but in later years the results obtained by complete dissection have been so excellent, both as regards eradication of the disease and the prompt restoration of function, that this method has been used exclusively.

The technic of operation is described in detail and well illustrated.

Treatment of Obstetric Brachial Paralysis with a Report of Fifty Cases. SAMUEL W. BOORSTEIN, New York. *The Journal of Bone and Joint Surgery*, October, 1923.

Obstetric brachial paralysis should be treated by the orthopedic surgeon as early as possible. If treated early and properly, one may expect in the mild cases a good recovery in three or four months. The more severe cases will require about six or seven months for a complete recovery. Nerve operations are indicated if no improvement results in four months. If sufficient improvement is noticed in four months, one may wait for four months more. The shoulder should be put immediately in a splint or brace to prevent stretching of the paralyzed muscles and contraction of the unopposed muscles. The support must be kept up for a very long time, for about eight to nine months, as deformities may occur. Adhesions may occur, due to slight injuries of the capsule, but these can be prevented. The only deformity that it is hard to prevent is the pronation of the forearm. The posterior dislocation is a sequel to the unbalanced paralysis of the shoulder muscles and may be prevented in most cases by proper orthopedic methods. The obstetrician can prevent the condition in many cases by proper management of the shoulder. Taylor's procedure seems to be the most suitable for the nerve operations. Sever's operation is the best for correction of the shoulder deformities. Hooking of the coracoid process should be corrected by a subperiosteal resection. Pronation should be corrected by a tenotomy of the pronator radii teres. One may also transplant that muscle to use it as a supinator.

Book Reviews

Die Methoden der Lokalanästhesie in der Bauchchirurgie und ihre Erfolge. Von Prof. Dr. HANS FINSTERER, Primarius der chirurgischen Abteilung im Spitale der Barmherzigen Brüder zu Wien. Octavo; 196 Seiten; 42 Abbildungen. Berlin und Wien: URBAN UND SCHWARZENBERG, 1923.

There are few books in surgery written in a more enthusiastic and dogmatic fashion than this. It discusses methods

of anesthesia by injection directly into the abdominal wall and by conduction. Under conductive anesthesia are described paravertebral, splanchnic, parasacral, epidural, and lumbar anesthesias. The operations discussed include renal and gynecological as well as those of the digestive system. As far as results are concerned one is led to believe they are none but the rosiest, for death from shock, injury to the liver, post-operative vomiting, acute gastric dilatation, pulmonary complications, and paralytic ileus are virtually nonexistent in Finsterer's records.

Superficially this work concerns anesthesia, but actually it is a comprehensive treatise on abdominal surgery. It is to be expected that Finsterer would not write of anesthesia in operations upon the stomach without going into a discussion of the various methods of stomach resection,—a subject in which he has had much experience and interest and in which he has some very definite opinions. The result is a very valuable book in local anesthesia and in the surgery of the stomach, in both of which fields, we in America are comparatively little experienced.

Excursions Into Surgical Subjects. By JOHN B. DEAVER, M.D., Emeritus Professor of Surgery, University of Pennsylvania; Surgeon-in-Chief, Lankenau Hospital, Philadelphia; and STANLEY P. REIMANN, M.D., Assistant Professor of Experimental Pathology, University of Pennsylvania; Chief of the Department of Pathology and Bacteriology, Lankenau Hospital, Philadelphia. Octavo; 188 pages; 30 illustrations. Philadelphia and London: W. B. SAUNDERS COMPANY, 1923.

Not a few of the leaders in medicine and in surgery have reflected upon their experiences in the form of essays. Deaver has here published his lectures, the subjects of which are (1) Peptic Ulcer, (2) Jaundice, (3) Diseases of the Bile-passages, (4) Trials, Tribulations, and Joys of a Surgeon and (5) Some Surgical Conditions of the Intestinal Tract. There are three additional articles by Reimann.

This book cannot be judged by medical standards alone. The reflections of experienced, prominent surgeons have a certain surgical value, but we look into them more for literary value, for style, and for mental stimulation (in which Deaver does not depart far from the average), rather than for a review of surgical topics which are accessible in our periodicals. Flashes of rhetoric, poetical fancies, dexterous decorative language, epigrammatic expressions, coupled with sound surgical sense would mean perfection in such essays. Moynihan, for example, attains this grade, but Deaver falls short of it.

A Treatise on the Diseases and Injuries of the Rectum, Anus and Pelvic Colon. By J. RAWSON PENNINGTON, M.D., F.A.C.S., Proctologist to Columbus Hospital, Veterans' Hospital No. 30, and U. S. Marine Hospital; Past President, American Proctologic Society; Fellow of the Chicago Society of Medical History; Corresponding Member, Royal Society of Medicine, London (Surgical Section); Formerly Professor of Rectal Diseases, Chicago Policlinic. Large octavo; two plates and 677 illustrations. Philadelphia: P. BLAKISTON'S SON & Co., 1923.

This book contains a huge fund of information, well arranged and well digested. The history of proctology is discussed, and almost every chapter is adorned with portraits of medical men beginning with Hippocrates. It is rather astonishing to be confronted with portraits of Loomis, Jacobi, Emmett and others in a treatise on proctology. The anatomy of the rectum and pelvic colon are well described. Such conditions as hemorrhoids, fistulae, perianal abscesses, pruritus are dealt with in detail, as well as the more serious lesions, such as prolapse and tumor. Operative technic of the rectum and anus covers more than one hundred pages.

A special part of the volume deals with diseases of the pelvic colon occupying the last two hundred pages. The current methods of treatment are given, the author often describing methods of treatment and operations devised by himself.

Many case histories, concisely presented, are interpolated in small print. An excellent bibliography is appended to each chapter. The illustrations, some original, many from diverse sources, are adequate.

Précis Clinique et Opératoire de Chirurgie Infantile. Par L. OMBRÉDANNE, Professeur agrégé à la Faculté de Médecine de Paris, Chirurgien de l' Hôpital des Enfants-Malades. Octavo; 1139 pages; 584 figures. Paris: MASSON ET CIE, 1923.

A surgery of childhood diseases should contain only those conditions which, as a rule, either are not found in adult life or, if they are, present different pictures. Under these circumstances, congenital anomalies naturally form the bulk of the diseased conditions. Ombrédanne's book succeeds very nicely in being just this sort of work. It is a treatise largely of the congenital anomalies from head to foot which invite surgical interference in childhood, and though this includes many abnormal conditions, they are treated in no superficial manner. As an example, the consideration of the congenital abnormalities in the face is as complete and enlightening as in the best surgical text-books. The author in assembling his material has given an excellent perspective of surgical conditions and surgery in childhood.

Physical Diagnosis. By RICHARD C. CABOT, M.D., Professor of Medicine in Harvard University; formerly Chief of the West Medical Service at the Massachusetts General Hospital. *Eighth Edition.* Octavo; 536 pages; 6 plates and 279 figures. New York: WILLIAM WOOD AND COMPANY, 1923.

That Cabot's text-book has arrived at the eighth edition is evidence that it fills a great present need, probably by reason of inherent excellence in the method of presentation.

Cabot's Physical Diagnosis is more used by medical students in this country than any similar work, and among them has almost the authority of an oracle. It is truly unfortunate that the distinguished author has not seen fit to revise it more thoroughly.. In the next edition we hope that some polygraphic and electrocardiographic tracings of normal and pathological cases will replace the rather pointless illustrations of commonly used stethoscopes and their parts. Medical text-books should express the art of their time and a work on physical diagnosis should discuss the instruments currently used. We refer especially to the use of the spirometer, oxygen metabolism apparatus, Dare hemoglobinometer and Bürker counting chamber. Sweeping condemnation of the tambour sphygmomanometer seems pointless at present in view of its wide acceptance by life insurance companies. The ophthalmoscope, the otoscope and the head mirror are also useful aids in physical diagnosis. No mention is made of Head's zones and their significance in abdominal, thoracic and cephalic disease, although recent journal contributions indicate their gradual acceptance. Pottenger's work has been ignored. No mention is made of tracheal fixation as a symptom of mediastinal disease.

We are happy to see the light dawning in the discussion of emphysema. It is the distension of the lung which gives hyperresonance. The distension of any part varies as the elasticity of the remainder changes. The distension is conditioned by the zone of the myotomes involved, as pointed out by Bullowa in his recent paper on pulmonary segment reflexes. The suggestion that emphysema ever compensates (even in brackets) is unfortunate. It never does.

Osteitis cystica, Recklinghausen's disease is not mentioned though its occurrence is sufficiently frequent. Cultures never decide the diagnosis of diphtheria (p. 28). It is a dangerous teaching to say that it may and ignores the existence of the carrier state. Pressure on the tonsils and gagging to evert the fossae are useful procedures. It is also worth while to examine the ears; tophi have been known to occur there.

The many good points in Cabot's text-book have been so frequently discussed that the reviewer feels it will be no service to the author or to others to emphasize them. He has, rather, deliberately sought to point out its shortcomings.

American Journal of Surgery

QUARTERLY SUPPLEMENT of ANESTHESIA & ANALGESIA

(American Journal of Anesthesia and Analgesia)

Printing Papers from the Transactions of the

Interstate Association of Anesthetists
American Association of Anesthetists
Canadian Society of Anesthetists
Scottish Society of Anesthetists
Mid-Western Association of Anesthetists
Pacific Coast Association of Anesthetists
National Anesthesia Research Society
New York Society of Anesthetists
Royal Society of Medicine, Anesthetic Section
Boston, Providence, Toledo, Louisville, Indianapolis, Chicago, Kansas City, Colorado, Seattle, Northern and Southern California Societies of Anesthetists

F. H. McMECHAN, M.A., M.D., Editor

Associate Editors

JAMES TAYLOE GWATHMEY, M.D.
DUDLEY W. BUXTON, M.D., M.R.C.P.
WILLIS D. GATCH, M.D., F.A.C.S.
JOHN D. MORTIMER, M.D., F.R.C.S.
PROF. C. BASKERVILLE, Ph.D., F.C.S.
ARTHUR E. HERTZLER, M.D., F.A.C.S.
WM. HARPER DEFORD, D.D.S., M.D.
ISABELLA C. HERB, A.B., M.D.
G. A. H. BARTON, A.B., M.D.
SAMUEL JOHNSTON, M.A., M.D.
FRANCIS E. SHIPWAY, M.A., M.D.
CHARLES K. TETER, D.D.S.
CARROLL W. ALLEN, M.D., F.A.C.S.
EDWARD H. EMBLEY, M.D., B.Ch.
TORRANCE THOMPSON, M.D.
PROF. YANDELL HENDERSON, Ph.D.
E. I. McKESSON, A.B., M.D.
ARTHUR E. SMITH, M.D., D.D.S.
J. F. W. SILK, M.D., O.B.E.
H. E. G. BOYLE, O.B.E., M.R.C.S.

January — *CONTENTS OF THIS ISSUE* — *1923*

SURGERY IN PATIENTS WITH OBSTRUCTIVE JAUNDICE.	Waltman Walters, Rochester, Minn.	2
THE PULMONARY TUBERCULAR PATIENT AS A SURGICAL RISK	C. E. Yount, Prescott, Ariz.	4
CURRENTS IN THE PROGRESS OF ANESTHESIA	David E. Hoag, Pueblo, Col.	10
IMMEDIATE AND REMOTE ILL-EFFECTS OF INSUFFICIENT OXYGEN DURING ANESTHESIA	Eugene Cary, Chicago, Ill.	14
THE BREATHING OF NEPHRITICS	Beaumont S. Cornell, Brockville, Can.	16
SOME UNUSUAL PHENOMENA FOLLOWING ANESTHESIA	J. E. H. Atkeisson, Chicago, Ill.	17
THE SUSPENDED RESPIRATION TEST WITH PARTICULAR REFERENCE TO ITS VALUE IN DIAGNOSIS IN CASES OF TOXEMIA OF PREGNANCY	Gilbert Fitz-Patrick, Chicago, Ill.	18
SCOPE AND UTILITY OF THE THERAPEUTIC ADMINISTRATION OF OXYGEN	Alvin L. Barach, New York City	21
A NEW ETHER DROPPER	Lyman G. Barton, Plattsburg, N. Y.	28

DEPARTMENTS

EDITORIALS - - - - - - - - 26

SOCIETY PROCEEDINGS - - - 28 QUARTERLY INDEX - - - - - 29

SURGERY IN PATIENTS WITH OBSTRUCTIVE JAUNDICE.*

WALTMAN WALTERS, M.D.,
Fellow in The Mayo Foundation
ROCHESTER, MINNESOTA

Among patients who present themselves for operation, there are few disease conditions more serious than that of obstructive jaundice. In this disease the operative mortality is high regardless of the skill of the operating surgeon.

THE OBSTRUCTIVE JAUNDICE PATIENT AS A POOR SURGICAL RISK.

There are several reasons why patients with obstructive jaundice are poor operative risks. In many instances the coagulation time of their venous blood is elevated to such an extent that cut surfaces ooze continually and the bleeding is stopped with difficulty, if at all.

It has been the experience in the Mayo Clinic that the renal function of patients with obstructive jaundice is greatly reduced. Almost all such patients have a variable amount of albumen in the urine, and in addition many have a decrease in urinary output and erythrocytes indicative of acute nephritis. If the obstructive jaundice continues without relief, uremia usually closes the scene, since the function of the kidney and of the hepatic cell is decreased by the circulating bile. The ability of the hepatic cell to receive carbohydrate and store it as glycogen, to receive proteoses and separate the amino acids, is partially destroyed, and the patient becomes toxemic. Finally, in most cases the tissues become dehydrated, and the patients lose their appetite for food and water. Moreover, much of the body fluid is lost by the vomiting and persistent diarrhea that is common in most of these cases, owing to the inability of the patients to metabolize the fat which must be mixed with bile in the intestine in order to be assimilated.

HEMORRHAGE AND COAGULATION TIME.

The records in the Mayo Clinic during 1918, 1919, and 1920, of patients with obstructive jaundice at the time of operation who died, were reviewed for the purpose of determining the cause of death and the relation of such cause to the degree of jaundice and the coagulation time of the venous blood. It is of interest to note that 50 per cent. of the deaths were due to intra-abdominal hemorrhage, at least a large amount of blood was found in the peritoneal cavity. All the deaths occurred from one to seven days after operation, as might be expected with continuous oozing of blood. If the cystic artery or one of its branches were bleeding death might be expected immediately following operation. In none of the cases which came to necropsy could the exact source of the hemorrhage be found.

A careful study was made of the coagulation time of the blood in patients who died from intra-abdominal hemorrhage, and it was found that 68 per cent. had a coagulation time of more than nine minutes. The two best known methods for determining time of the blood are the Boggs' method, by which the time required for blood from a stab wound in the ear to coagulate is estimated, and the Lee and White method, which is more easily followed and more accurate. In Boggs' method the blood is combined with the tissue serum from the lacerated ear which hastens the coagulation time while in the Lee and White method the blood is drawn directly from a vein into a glass syringe and then placed in a small glass tube, both having been cleansed with normal salt solution.

The value of the Lee and White method should be emphasized because, as they have shown, and as we have corroborated, the blood of a jaundiced patient obtained from a stab wound in the ear does not form a true indication of the coagulation time. Lee and Vincent produced obstructive jaundice in dogs experimentally and proved that retardation of coagulation time appeared at the end of the fifth week of the jaundice. In the obstructive jaundice observed in man, the extent of retardation of coagulation time varies with factors other than time. *Lee and Vincent were able to produce an immediate reduction in the coagulation time of the blood of jaundiced dogs by intravenous injections of 2 per cent. solution of calcium lactate; such reduction being sustained for two or three days without deleterious effect on the general condition of the animals. This measure has been adopted in the Mayo Clinic in the preparation of jaundiced patients for operation; 5 c.c. of a 10 per cent. solution of calcium chlorid in redistilled water is given daily for three days in intravenous injections. This method has been used in the preparation of twenty patients during the last four months and in every instance the coagulation time was reduced to normal, which is from four to six minutes. These patients were all operated on, and none had the slightest difficulty in canvalescence. Some of them had been considered poor operative risks because of subcutaneous and petechial hemorrhages, and bleeding from mucous membranes. One patient had been troubled with bleeding from the gums previous to the injections of calcium chlorid; after the injections the gums*

*Read during the Joint Meeting of the American Association of Anesthetists and the Mid-Western Association of Anesthetists, Hotel Jefferson, St. Louis, May 22-24, 1922.

did not bleed even after brisk brushing with a tooth brush.

Calcium and Toxemia.

Besides lowering the coagulation time some observers believe that calcium is beneficial in decreasing the toxemia of patients with obstructive jaundice. King and Stewart, who have studied the liver experimentally, believe that the bile pigments are the toxic elements of the bile, and that these pigments destroy the cells of the liver and kidney. These observers believe that calcium or sodium combine with these pigments rendering them less toxic and hence forming a protective mechanism against the circulating pigments in obstructive jaundice. Here again intravenous injections of calcium are valuable since in this manner the calcium is placed directly in the blood stream. The question may be asked, "Why not give the calcium by mouth?" In a recent article, Grove and Vines state that they have proved experimentally, that calcium salts given by mouth have no influence on the calcium in the blood.

Lee and Vincent have proved that the intravenous injection of calcium salts in small doses is not harmful. Cambell has given calcium acetyl salicylate intravenously to fifty-five patients in doses of 0.5 gm. in 10 c.c. of distilled water at three day intervals; in some cases he had given as many as seven intravenous injections for the relief of neuralgia and myalgia. I have given 10 c.c. of a 10 per cent. solution of calcium chlorid to two pregnant dogs over a seven day period without any apparent ill effect; during this time both dogs delivered several living puppies. The twenty patients who were given the intravenous injections of 5 c.c. of a 10 per cent. solution of calcium chlorid had no reaction other than a slight feeling of heat over the body which lasted for a few seconds. The reaction is very slight if the solution is injected slowly, allowing five minutes for the injection.

The duration of the reduction in coagulation time for each injection varies in individual cases, from three to ten days. If the coagulation time tends to lengthen, it can be reduced by another injection of the calcium chlorid solution.

Glucose and Glycogenic Function.

Since the function of the liver is partially arrested by the circulating bile pigments, as I have mentioned, the glycogenic function is reinforced by the administration of a 10 per cent. solution of glucose by means of the Murphy drip which is allowed to run for each alternate hour of the day. If for any reason the patient fails to absorb the solution of a 3 per cent. solution of glucose is given *subcutaneously;* at least 1800 to 3000 c.c. being given in twenty-four hours.

The dehydration of patients' tissues, which has resulted from loss of appetite and chronic diarrhea, is overcome by the patients' drinking twenty glasses of water each day. If our patients are unable to tolerate large quantities of water by mouth we supply fluids by means of subcutaneous injections of normal salt solution. A soft, generous diet devoid of fats, and liquid nourishment between meals is, as a rule, easily assimilated and well tolerated by the patient.

After the patient is prepared for operation the best operative procedure suitable for the case must be considered. The common duct may be explored and the gallbladder removed; or the obstruction may be removed and the gallbladder drained, leaving the organ to be removed after the jaundice has subsided.

Surgical Precautions.

We believe that it is better to relieve the biliary obstruction first. If the obstruction is due to a stone in the common duct the stone should be removed, and the common duct drained until the jaundice has subsided and the patient's general condition has improved enough to permit cholecystostomy or cholecystectomy. In some instances it will be necessary to open the gallbladder, remove the stones, and institute drainage. It is self evident that the various steps of the operation must be carried out with the utmost gentleness; since trauma of the tissues, particularly the liver, invites hemorrhage, and for this reason cholecystectomy should not be performed at the primary operation if it can be avoided.

Summary.

1. Since the postoperatvie intra-abdominal hemorrhage is so often the cause of death of patients with obstructive jaundice the coagulation time of the blood should be determined before operation and if the time is lengthened beyond six minutes an attempt should be made to reduce it by intravenous injections of calcium chlorid.

2. Calcium chlorid, given intravenously, reduces the coagulation time of the blood and combines with the bile pigments circulating in the blood stream rendering them less toxic.

3. The diminution in the supply of glucose to the tissues in the body as a result of the toxemia of the liver cell is overcome by supplying glucose directly to the tissues by means of protoclysis and subcutaneous injection.

4. Large quantities of water aid in eliminating

the toxic bile pigments and increase the fluids of the body.

5. In operating for obstructive jaundice the various steps of the operation should be carried out with the utmost gentleness, in order not to traumatize the tissues, particularly the liver, and for this reason cholecystectomy should not be performed at the primary operation if it can be avoided.

BIBLIOGRAPHY.

1. Boggs: Quoted by Webster, R. W.: Diagnostic Methods, Chemical, Bacteriological and Microscopical. Philadelphia, Blakiston, 1909, pp. 403.

2. Cambell, A.: The Intravenous Administration of Calcium Acetyl Salicylate. *Brit. Med. Jour.*, 1921, Vol. ii, pp. 37-38.

3. Grove, W. R. and Vines, H. W. C.: The Control of Hemorrhage by Intramuscular Injection of Calcium Chlorid. *Brit. Med. Jour.*, 1921, Vol. ii, pp. 40-41.

4. King, J. H., and Stewart, H. A.: Effect of the Circulation of Bile on the Circulation. *Jour. Exper. Med.*, 1909, Vol. xi, pp. 673-685.

5. Lee, R. I., and White, P. D.: A Clinical Study of the Coagulation Time of Blood. *Am. Jour. Med. Sc.*, 1913, Vol. cxlv, pp. 495-503.

6. Lee, R. I. and Vincent, B.: The Relation of Calcium to the Delayed Coagulation of Blood in Obstructive Jaundice. *Arch. Int. Med.*, 1915, Vol. xvi, pp. 59-66.

THE PULMONARY TUBERCULAR PATIENT AS A SURGICAL RISK.*

C. E. YOUNT, M.D.

PRESCOTT, ARIZONA.

Calot's dictum, "Le bistouri, c'est l'ennemi"[1] of the surgical tubercular would seem to challenge all surgeons operating tuberculars.

Quite the opposite thought came from W. W. Keen, in 1906, when he said that, "surgeons have not been very active in what I regard as the most magnificent crusade of the last ten years, the crusade against the great white plague * * *. It has been chiefly carried on by the physicians. We surgeons have been derelict in our duty because we have not come to their help in the matter of surgical tuberculosis as we should have done."[2] The prodigality of the literature covering every phase of the surgical study of hyperthyroidism as compared to the paucity of literature on the tubercular as a surgical risk, would indicate that the words of Keen had fallen upon stony ground.

THE PROBLEM OF THE TUBERCULAR SURGICAL PATIENT.

In comparing the tubercular who requires surgery with the case of hyperthyroidism who can be relieved only by surgery, I have not chosen that which by comparison is, "irrelevant, immaterial, and not pertaining to the question"; in fact, I go so far as to predict that our latest laboratory apparatus,—the metabolism measure,—will, if applied with the same assiduity and zeal to the study of the tubercular, reveal an interesting comparison in the two types of toxicosis. Again, as thyrotoxicosis by reason of its extra-hazardous effect has spurred the profession to evolve a most scientific exactitude combined with the highest surgical skill in dealing with it, so in turn, should the surgical tubercular with equal right share in the application of these scientific attainments.

For those of us who practice medicine and surgery in the Southwest, conditions are changing. Osler said in 1912,[3] in speaking of the climatic treatment of tuberculosis, "among high altitudes in the United States, the Colorado resorts are the most important. Of others, those in Arizona and New Mexico have been growing rapidly." The tubercular has been seeking a "cure" in the new Southwest for over two decades. With the end of the world war, the United States found herself with 70,000 tuberculars to care for. Thousands of these ex-soldiers are now *chasing the cure* in that region the reputation of which for *cures* is "growing rapidly." Thus the whole southwest is becoming known as a resort; the smallest villages, and the outlying ranches are being occupied by tuberculars. This influx of tuberculars has imposed and will continue to impose upon the profession of the Southwest a special knowledge of this disease, and it is incumbent upon us *to be prepared* and to measure up to every requirement of the tubercular's multifarious medical and surgical needs.

For the purpose of this paper, by *tubercular* will be understood the arrested, quiescent and active cases of pulmonary tuberculosis.

We do not include cases of extensive activity, for while these may and frequently do require surgery, which they will receive when it is sufficiently urgent, their lung condition being very probably hopeless, the ultimate result will be death from pulmonary tuberculosis regardless of the surgery. To this latter class, however, when operated, will be applied all the principles of safety promulgated for the first group.

FACTORS DETERMINING RISK.

What are the factors which determine the risk in any operative case, plus a chronic mixed infection of the lungs. As anesthesia of some form is necessary to render every patient operable, it follows that inhalation anesthesia, when used, must be an im-

*An address presented by title during the Joint Meeting of the American Association of Anesthetists and the Mid-Western Association of Anesthetists, Totel Jefferson, St. Louis, May 22-24, 1922.

portant factor in prognosis where latent, acute or chronic infection of the lungs exists. Leonard Freeman, of Denver,[5] has observed that the lungs may be of more importance than the heart in determining the surgical risk.

F. H. McMechan,[16] presumably voicing the opinion of the National Anesthesia Research Society in his address before the Chicago Medical Society in October, argues that, "Because fatalities still occur with undiminished regularity, under both local and general anesthesia, even in the practice of the most experienced surgeons and anesthetists, it becomes vitally necessary to formulate some routine plan by means of which not only the patient's fitness to take an anesthetic may be determined in advance, but also, and more especially how anesthesia may be given with the utmost safety to such hazardous risks." The work of this society is along helpful lines; they can even now report progress; we hope to gather much of value concerning the tubercular in their future reports.

From our review of the literature we deduce that there are three schools concerning the anesthesia of choice in operating tuberculars: (1) Those using ether or some combination of it; (2) those using nitrous oxid-oxygen; (3) those using local, regional and spinal anesthesia. There are most excellent men, experienced operators and anesthetists in each school, each reporting success, each pointing out the failures and dangers of the other two, all with their mortality. It would seem that in reviewing these criticisms and objections, that most of them had been made from personal observations, rather than by observation coupled with a scientific laboratory and post-mortem check on man and animals. It is this seeking after the truth concerning the operative tubercular and all forms of anesthesia that we would urge upon all those having access to experimental laboratories. The truth, when found, shall free us from the traditions of our profession and the laity concerning the *tubercular and anesthesia,* and give us a rational basis for a choice of anesthetics in these cases. The work of E. Zueblin, J. B. Rogers, and others, is along the right line, but there remains yet so much to be accomplished.

ETHER ANESTHESIA.

It is worthy of note that the first patient operated upon under ether anesthesia was a "man tall and feeble, with tubercular heredity." Since October, 1846, surgeons have been operating tuberculars under ether. Those who are satisfied with the results of this method may be said to have achieved their success through three factors: *First,* a careful examination and selection of cases; *second,* an expeditious, adaptable operative technic; and, *third,* skillful anesthesia. These three are indispensable to success; the inability to apply all of them explains an upward mortality curve, and is responsible for continued search after methods. We know a surgeon operating largely upon tuberculars, who requires that they be given a careful physical and *x*-ray examination before operation, and another six weeks after operation. It is his opinion that ether, when properly administered, is not detrimental to tubercular cases. His opinion is concurred in by a considerable number of excellent surgeons. There are others like Hedblom[8] who admit that "tuberculous patients are relatively poor risks." Witherhill, of Denver,[9] in discussing pulmonary and cardiac sub-standard risks, operated under ether, said: "I should never refuse an invalid a necessary surgical operation because he happened to have a heart lesion, or even advanced pulmonary tuberculosis." There are men like Archibald, Ochsner, De Costa, Leonard Freeman, and others who believe that ether is responsible for activation; others who hold it responsible for pulmonary hemorrhages, recent and remote, as well as being the cause of pneumonia and various organic parenchymatous degenerations.

ETHER-OIL COLONIC ANESTHESIA.

Realizing the limitations of ether anesthesia in pulmonary troubles, many began looking for safer modifications and combinations. The possible advantages of ether colonic administration in the presence of latent bronchial and pulmonary inflammations was suggested by Dr. L. W. Bacon[9] in 1906. Experimental work had been done before this, but the real progress in the United States will be associated with the names of Sutton, Gwathmey, Baskerville, Wallace and Lathrop. They have perfected a technic of administration whereby the "synergistic action of drugs"[11] employed gives the desired anesthesia. Lathrop[10] states: "The value is undoubted in cases in which absorption must be minimized on account of some lung, heart or kidney lesion." Again, that, "Wallace made a study for one hour, by sphymographic tracing, of a number of animals under ether-oil anesthesia during which the pulse and respiratory tracings never varied. This fact has been well demonstrated in many hundreds of patients surgically anesthetized by this method, in whom without any supplementary anesthetic, the pulse, respiration, reflexes and blood pressure all remained constant." Gwathmey, in discussing Lath-

rop's paper, said: "It is one of the safest methods. The margin between full surgical anesthesia and a toxic dose is greater than with any inhalation method. It is one of the most pleasant methods for the patient, as attested by the fact that those who have tried other methods prefer the colonic. A greater relaxation of the musculature exists than is usual with any inhalation anesthetic. A smaller amount of ether per hour is required than by any other method. The estimated amount is two ounces per hour, which seldom varies. An anesthesia deep at one time and light at another, is physiologically impossible. The brain is more completely protected against stimuli than by any method of inhalation anesthesia."

Like all new methods, ether-oil colonic anesthesia is not always a success in the hands of the novice. Our experience with the method, especially in abdominal work in tuberculars, has not given that degree of relaxation so greatly desired, but we can bear witness to the small amount of ether required, and if this *exhalation* anesthesia shall be proven devoid of injury to the lungs and other organs, we shall endeavor to perfect our methods of administration and operative technic and adapt them to selected cases of pulmonary tuberculosis.

NITROUS OXID-OXYGEN ANESTHESIA.

Nitrous oxid anesthesia had its inception in obstretrical, dental and other short operations. Gradually it began to be applied to sub-standard risks; its popularity here has made it the frequent anesthetic of choice in operations upon tuberculars.

One of the best known exponents and investigators of nitrous oxid-oxygen analgesia, is Crile of Cleveland. The profession will ever be indebted to him for his scientific and painstaking researches in the nature, causation, prevention, and control of surgical shock. He states[12] that, "in our clinic we first employed nitrous oxid-oxygen analgesia for bad risk cases of exophthalmic goiter, and have gradually extended its use to bad risk cases of all kinds, until now it is employed in approximately 90 per cent. of all our cases. We have been collaborating with members of the anesthetic staff in our endeavor to perfect the technic of administration of *analgesia* as the greatest aid to surgery of which we can at the present time conceive, since by means of it the patient undergoes a pleasant experience and a shockless operation, and above all, because he passes through the operation with his internal respiration unimpaired, but with all his factors of safety undiminished." In lung surgery *per se,* Gwathmey's[13] conclusion in the A. E. F., was to the effect that the choice lay between ether and nitrous oxid. He further stated that full surgical anesthesia, which is "safe without preliminary medication, is unsafe following preliminary medication," to our mind a very important observation. These remarks need not be considered as contradicting his more recent views as previously quoted concerning ether-oil colonic anesthesia, but rather as an observation in lung surgery in war. How the objections of "preliminary medication" have been surmounted, he presents in the *Annals of Surgery* for August, 1921. "Morphin and magnesium sulphate synergistically used give good relaxation when supplemented by (a) nitrous oxid-oxygen to abolish consciousness and for its added analgesic effect; (b) or by using a local analgesic for the skin and peritoneum.

J. T. Halsey,[14] of Tulane University, believes that nitrous oxid-oxygen anesthesia should be used whenever possible in all tuberculosis cases as a precaution against lighting up or aggravating pulmonary lesions, which is a real danger if ether is used.

Archibald, of Montreal,[15] who has probably operated more pulmonary tuberculars than any other surgeon in America, has some very excellent ideas concerning the anesthetic. "First, it is important to choose an anesthetic that will do the least harm to the lungs. Nitrous oxid-oxygen undoubtedly fulfills best this requirement; morphin and atropin are given half an hour previous to operation, and novocain is freely used to help out the gas."

The author has analyzed the operative results with regard to the effect of the anesthetic upon the lung condition, and has found that in the few cases, eight or ten, where ether was used, there was a much higher percentage of anesthetic ill effects than with nitrous oxid-oxygen. Indeed, the latter, in his experience, never has any obvious immediate effect on the lungs.

While it is obviously necessary to avoid the irritating effects of ether upon the pulmonary mucosa, one should also remember that the rapid and deep respiratory movements of induction, as also any violent exertion of the patients on the operating table, must be equally avoided.

Undue physical exertion is bad for a tuberculous lung. Consequently, the author does not hesitate to ask the anesthetist to add sufficient chloroform to the nitrous oxid-oxygen to get the patient quiet. "I have lately come to the conclusion, having regard to the somewhat forced respiration which is frequently seen during the induction of nitrous oxid-oxygen anesthesia, that it would be better to begin the anesthesia with chloroform, administered very

slowly and quietly, and then to continue with nitrous oxid-oxygen as soon as the patient has passed the stage of excitement. In any case, the quietest anesthesia possible is essential. Chloroform throughout is not advised."

LOCAL ANESTHESIA.

Allen, in his work, "Local Anesthesia,"[17] cogitates upon general anesthesia *versus* local anesthesia, thus: "Had the position been reversed and local anesthesia been discovered first, general anesthesia might now be struggling to displace it from its pedestal, and it is not to be doubted but that local anesthesia would have reached a much higher plane of development, for in all operations it is suited to safety and comfort." Professor Matas, writing the introduction to Allen's work, speaking of general *versus* local anesthesia, says: "The problem of shock, the secondary nausea, and vomiting, the pulmonary complications, embolism and thrombosis, and above all, the degenerative auto-intoxications following the action of these somatic poisons on the eliminating and other organs still remains to be reckoned with * * *. Combinations of novocain and adrenalin in various isotonic dilutions—by practically eliminating the toxicity of the analgesic, increasing its stability, durability and intensity—have so expanded the technic that in the hand of an expert, peripheral analgesia may be made to encompass in its grasp almost the entire domain of operative surgery."

Bartlett,[18] in a very fair summary of indications for local anesthesia, says: "The indications for local anesthesia are far from universal. It depends, first of all, upon the ability and inclination of the surgeon, to say nothing of the condition and attitude of the patient, as well as his age, race, training, and intelligence, all of which must be taken into consideration. Local anesthesia may be reasonably considered indicated in obstructive conditions of the air passages, inflammatory respiratory trouble, circulatory decompensation, acute abdominal emergencies, renal insufficiency, toxic conditions (goiter), chronic alcoholism, marked obesity, and very old age. The same is true if a general anesthetic has been used in the very recent past, and if the patient must for any reason become ambulatory immediately after the operation."

REGIONAL ANESTHESIA.

In this type of anesthesia the nerve blocking solutions are applied as nearly as possible to the origin of the nerve, or along the nerve trunk. Obviously there are many objections to this method, but as developed and practised by Professor Victor Pauchet, and advocated by Sherwood-Dunn,[19] doubtless it has a limited field in the hands of the expert.

SPINAL ANESTHESIA.

This may be considered as a type of regional anesthesia, and while applilable to certain cases, has its distinct limitations in the tubercular. We did a little experimental work with this method in 1901, revived it again in 1904, allowed it to lapse, again revived it in 1920, but we never have acquired the confidence in the method so desirable in a safe anesthetic. A. S. Boyd and Carl C. Yount[25] have reported 6,229 operations with only four deaths, and one surgeon in New Orleans has had over 6,000 cases with only one death.

Oscar M. Schere, who has had much experience in operating tuberculars in one of the Denver sanatoria, speaking of their chest surgery, says: "All of their operative work was done under spinal anesthesia, since their medical staff was opposed to the use of general anesthesia in these patients."

However, in the tubercular who is ever prone to that insidious complication, tubercular meningitis, headache and other centric disturbances, coming on from a few hours to five days after spinal analgesia, give the surgeon considerable cause for worry until the conditions disappear. Yet he who is master of the technic, need have no unnecessary apprehensions. It should also be borne in mind that the tubercular presents a local respiratory handicap, and should the anesthetic solution course so high as to involve the respiratory centers, we would have a most trying *accident* to deal with. When you let go of the plunger, you let go of your hold upon this type of anesthetic. Thereafter you must be able to direct its course by posture.

TECHNIC FOR SPINAL ANESTHESIA (YOUNT)

Preparation of Novocain.—Gr. 1 or 1-1/3 of powdered novocain is placed in a small dry clean test tube which is 2" x 2½" x ¼" to 5/16". A cotton plug is inserted. The tubes are loaded and stood on end in a glass with cotton in the bottom and cotton packed lightly around the tubes, and are usually sterilized about a dozen at a time. The glass is covered with several layers of gauze and this gauze tied on. It is then placed in the sterilizer and sterilized for twenty minutes at 15 lbs. pressure, and in our autoclave this converts novocain into a hard crystaline mass in the bottom of the tube. When a tube is desired the gauze cover is turned back and a tube removed with sterile forceps.

Syringe.—Syringes with a well fitting plunger, either Luer or Record type, 3 to 5 c.c. capacity, with

a spinal needle of short bevel, and cup to fit syringe without leakage are used. These are sterilized by boiling in plain water. Before use the syringe and needle are rinsed with sterile distilled water. One or 2 c.c. of sterile distilled water is now drawn into the syringe and the water is shot into the tube to dissolve the novocain. Sometimes it requires drawing back the plunger four or five times and sending the water against the crystals with considerable force. When they are dissolved the syringe is adjusted so that there are no air bubbles, the needle is attached and used for spinal puncture, or a different needle can be used for the spinal puncture.

Preparation of the Patient.—A prelimary hypodermic injection or morphin gr. 1/6 and atropin gr. 1/150 is given. The skin of the back is prepared by 50 per cent. tincture iodin applied over an area of 2 inches below a line drawn between the iliac crests and extending 2 inches beyond the crests on either side. Patient is sitting up across the table with feet resting on a stool and the back *bowed back*. The iliac crests are located and from that line the third or fourth lumbar interspace is determined. At this point I have the patient bend forward and backward a few times in order to determine whether I am between the spinous processes. I then drive my thumb nail into the skin until it makes a plain mark.

Anesthesia.—The special short beveled needle is inserted at the thumb mark in the median line, (I do not go to either side). One to 2 c.c. of spinal fluid are allowed to escape, then the syringe, with the novocain previously prepared, is coupled to the needle and the plunger allowed to come back slowly under the spinal fluid pressure. If there is no pressure, the plunger is very gently drawn out until the fluid in the syringe reaches the 3 or 4 c.c. mark. Then the plunger is slowly forced down and again allowed to return to the 2 or 3 c.c. mark. This is done 3 or 4 times. The needle is then withdrawn; the skin sealed with collodion or adhesive plaster, and the patient made to lie down with the head elevated by two or three pillows. Work can usually be started as soon as the field of operation is prepared. Anesthesia usually lasts from ¾ to 1½ hours. I use no adrenalin chlorid but am advised that some foreign operators do, and that they consider it a very valuable addition, as it prolongs anesthesia and enables them to go higher with the anesthetic.

For the headaches, which I have seen come on as late as the fifth day after operation, I find that absolute rest in a darkened room, and morphin hypodermically give as good results as anything I have tried.

CLASSIFICATION OF SURGICAL RISKS.

In the classification of surgical and anesthetic risks, we again quote McMechan: "In the present advanced state of surgical and anesthetic knowledge, the patient has a right to expect a fairly exact preoperative diagnosis, and a very exact preoperative prognosis. Skill in prognosis can only be gained by experience. The surgeons and anesthetists who make and record preoperative prognoses, and check them up with their results, will soon learn that the patient's physiopathological condition, or reserve vitality, is the paramount factor in recovery.

A. H. Miller, of Providence, R. I., has classified operative surgical risks as follows:

A.—*Good Risks*: Patients free from organic disease, whose condition is not likely to prove fatal.

B.—*Fair Risks*: Patients suffering from organic disease, whose surgical condition is not especially serious.

C.—*Poor Risks*: Patients whose surgical condition is so serious, or so far advanced as likely to result fatally."

We would add a *D class* to cover many of our tuberculars—*very poor risks*—patients suffering from extensive organic disease where the surgical condition is especially serious.

SURGICAL POINTERS.

The scope of this paper will not permit of a discussion of tubercular risks under regional surgery; that indeed would require a thesis in itself; but in passing we desire to call your attention briefly to the wonderful advances made in surgery of the chest during the war, and so successfully practiced since, in America by Willy Meyer, Archibald, Hedblom, and others. We note the lessened mortality when opreating under positive pressure.[22] Hedblom's[23] timely conclusions concerning empyema must not be omitted. "The recognition of tuberculous empyema was often difficult. A history of a primary pleurisy with effusion seemed more often to signify a tuberculous condition than did a pulmonary lesion, unless the latter was active and extensive. A tuberculous empyema might be present in the absence of clinical or *x*-ray evidence of pulmonary involvement. The typical microscopic picture in the sectional pleura, or the demonstration of the bacilli in the exudate might constitute the only evidence in such cases. A [12]tuberculous empyema not secondarily infected should not be drained, and should be aspirated only

for a considerable accumulation of fluid. For a tuberculous empyema secondarily infected, either by operation or spontaneously, drainage was necessary. In the absence of bronchial fistulas and bleeding, secondarily infected tuberculous empyema might be markedly benefited by antiseptic solution treatment. The amount of fibrosis or other pathological change in the lung in such cases determined the degree of expansion of the lung, whether following antiseptic solution treatment or decortication. If the lung failed to expand in whole or in part, a several-stage operation designed to collapse the chest wall was indicated. Tuberculous patients were relatively poor operative risks."

The use of the *x*-ray for diagnosis in intestinal tuberculosis has made rapid progress; its routine use should be practiced; better diagnosis will then be made, and embarrassing situations at operations minimized.

Since the war, those of us working in Prescott have operated 182 patients who were tubercular, covering fairly well the range of general surgery. The anesthesia was distributed as follows:

Gas-oxygen	16
Ether inhalation	29
Ether-oil colonic	47
Spinal	35
Local	55

We have endeavored to surround these sub-standard risks with every safeguard. We have constantly endeavored to adapt the anesthetic and the operation to the patient and ourselves. We have no optium method. Our experience is to the effect that nitrous oxid-oxygen preceded by local anesthesia, with a slight ether sequence where absolutely necessary, as advocated by Crile and others, is the best suited to most for these cases. We believe that where it is possible, operations should be done under local anesthesia. In certain carefully selected cases, spinal anesthesia may prove of great value. Ether-oil colonic anesthesia requires more clinical and laboratory proof of its safety in tuberculosis, though in our limited experience (47 cases) we have seen no untoward effects upon the lungs or intestines.

SUMMARY AND CONCLUSIONS.

The following points may be of service, when considering operation upon tuberculars:—

1. Except in most urgent cases the history must be taken, and that part pertaining to the respiratory system developed to the fullest. The clinical picture of this risk must be brought up to date, and the previous damage of this disease must be known and rated.

2. We should elect to operate during a period of improvement,[24] endeavoring to secure this desideratum by approved methods in cooperation with the internist.

3. Clinical preparaton—study of the temperature and pulse, *x*-ray, blood count and hemoglobin, urine examination. Wassermann, and blood pressure—should be made. The record of vital capacity and results of breath holding test will prove of value.

4. Team work is quite as much needed here as in the thyrotoxic cases. The internist, anesthetist, surgeon, assistants, and nurses in charge must work with intelligent cooperation before, during and after the operation.

5. The operating room should be kept at the proper temperature, no chilling of the patient should be permitted in the operating room or corridors. All the appliances for dealing with shock, and the accidents of anesthesia should be at hand and should be immediately serviceable.

6. The anesthetic should be that one, which after a careful estimation of the tubercular risk in consultation, offers the greatest advantages to the patient. (*Note*—In our sparsely settled districts, we often find it necessary to use the anesthetic which our anesthetist is most competent to administer.)

7. The pre- and postoperative care of the patient should not be left to the general nurse, but he should be specialized by a nurse of the highest intelligence, surgical training, and fidelity.

8. The internist, anesthetist, or surgeon who has not time to determine the degree of risk and prepare to safeguard his patient accordingly, has no moral right to present for operation, anesthetize, or operate upon pulmonary tuberculars, when there are those available who will take time to safeguard these sub-standard risks.

In conclusion, we believe that it is up to the general practitoner to be able to recognize early those conditions which arise as truly surgical conditions in the tubercular, and to know that because his patient is a tubercular that he is not always to be deprived of the relief surgery would afford his non-tubercular patient. It is equally imperative that the tuberculosis specialist know these facts and more. To the surgeon must come the knowledge that the *poor risk* tubercular may be made a safer risk by careful and painstaking study, planning the operation for the patient, and not sacrificing the patient to an immutable technic. Finally, the profession must

realize, as Samuel Robinson has pointed out, that:[4] "It is not until a balance has been reached between the internist's conservative lack of faith and the surgeon's sometimes dangerous leaning to experimental surgery, that progress occurs in the treatment of conditions whch are acknowledged to be beyond cure by medication alone." I submit that this progress has come to the thyrotoxic case, and its principles, if applied generally by surgeons, will result in lessening the risk in the tubercular, and the "internist's conservative lack of faith" will be supplanted by a wholesome confidence in the possibilities of well directed surgery.

BIBLIOGRAPHY.

1. R. Hertz: *J. A. M. A.*, Feb. 22, 1919, p. 616. Conservative Treatment of Surgical Tuberculosis.

2. Transactions: National Association for the Study and Prevention of Tuberculosis. 2nd Meeting, May, 1906, p. 593.

3: Osler: The Principles and Practice of Medicine, viii Edition, p. 226.

4. Musser and Kelly: Practical Treatment. Vol. iii, p.

5. *Colorado Medicine*: January, 1916, p. 8.

6. *The Journal of Radiology*: May, 1921, p. 38.

7. *American Journal of Surgery*: April, 1920, p. 44-46.

8. C. A. Hedblom: *Annals of Surgery*, 1920, Vol. lxxii, p. 288. The Treatment of Chronic Empyema.

9. American Practice of Surgery: Vol. i, p. 786.

10. Lathrope, Walter: Ether-Oil Colonic Anesthesia. *J. A. M. A.*, July 10, 1920, p. 82.

11. Gwathmey, James T.: Synergistic Colonic Analgesia. *J. A. M. A.*, Jan. 22, 1921, p. 222.

12. Crile, G. W.: Nitrous Ovid-Oxygen Analgesia in Major Operations. *Surgery, Gynecology and Obstretrics.* July, 1921, p. 74.

13. Gwathmey, J. T.: *Rhode Island Medical Journal*, 1920, Vol. iii, p. 41. Reviewed in *Surgery, Gynecology and Obstretrics*, July ,1920, p. 3.

14. Halsey, J. T.: Forcheimer's Therapeusis, Billings, Vol. iii, p. 321.

15. Archibald, E. W.: The Surgical Treatment of Ulcerative Tuberculosis Occurring Chiefly in the Course of Pulmonary Tuberculosis. Canadian Medical Association. Vol. 10, No. 9, p. 804, 1910.

16. McMechan: Safety First in Anesthesia. *Illinois Medical Journal*, November, 1921, p. 376.

17. Allen, Carroll W.: Local and Regional Anesthesia in the Surgery of Today. *Surgery, Gynecology and Obstretrics.* July, 1921, p. 27.

19. B. Sherwood-Dunn: Regional Anesthesia. F. A. Davis Pub., 1920.

20. *Medical Record*, New York, April 9, 1921, p. 630.

21. Gwathmey, J. T., and James Greenough: Clinical Experience with Synergistic Analgesia. *Annals of Surgery*, August, 1921, p. 185.

22. Willy Meyer: Fundamental Principles of Thoracic Surgery. *Medical Record*, New York, April 9, 1921, p. 593.

23. Carl A. Hedblom: Treatment of Chronic Empyema. *Medical Record*, New York, April 9, 1921, p. 629. Society Reports.

24. Beal, N. H.: *Canadian Medical Association Journal*, July, 1918. Vol. viii, No. 617.

25. A. S. Boyd and Carl C. Yount: *J. A. M. A.*, Feb. 24, 1917, p. 601. Routine Spinal Analgesia.

CURRENTS IN THE PROGRESS OF ANESTHESIA.*

DAVID E. HOAG, M.D.,
PUEBLO, COLORADO.

With the view of determining the present status of anesthesia as a specialty, and to provide a basic foundation for his Presidential Address at the Boston Meeting, Dr. Jos. E. Lumbard sent a rather lengthy questionnaire to those anesthetists, who were known to be devoting practically all their time and energy to the specialty. His tabulations appeared in the Anesthesia Supplement, April, 1922, and are very illuminating. I have taken a few of the main points of his questionnaire for my own theme, as he refrained from expressing a detailed opinion on some subjects of great importance, prefering to let the accumulated data speak for itself. Perhaps by re-emphasizing some matters, a few worth while lessons may be driven home.

ANESTHESIA AS A SPECIALTY.

To begin with—*What establishes a practitioner as an anesthetist?* A very apt summary of this matter is provided by G. A. H. Barton in his recent volume, *"Backwaters of Lethe."* A careful perusal of this article is well worth the time of any one.

No anesthetist should strive merely to be busy. Success comes more from being pre-eminently competent to handle anesthesia for any and all operative procedures by any methods or agents that may be indicated or required. Every anesthetist striving to maintain a position as a specialist should, if possible, be connected with the staff of one or more hospitals. All those who have the opportunity and talent should instruct students or interns. It is only too true that the present tendency is to avoid anesthesia and in so doing, students and interns are depriving themselves of a knowledge and practice which are important in their future careers as practitioners. The instruction of nurses and lay-persons in this very important branch of medicine is mentioned, only to be *absolutely condemned.* The practice is reprehensible and can not be censured too strongly. Nurses lack entirely the fundamental educational and scientific qualifications for becoming either responsible or competent anesthetists. If the administration of an anesthetic is not a part of the practice of medicine, then any interpretation of medical practice acts is all wrong. Taking human lives into the Valley of the Shadow, keeping them there and then bringing them back to their loved ones, is a

*Read during the Joint Meeting of the American and Mid-Western Associations of Anesthetists, Hotel Jefferson, St. Louis, May 24-26, 1922.

task that should not be relegated to lay-persons. This pernicious practice is being done purely for commercial exploitation by surgeons and hospitals, who pocket the profits and who seek to demoralize a specialty which they themselves are doing nothing to develop or advance. It would seem a policy to be heartily recommended that the Associated Anesthetists drop from their roster, such members as continue to instruct others than members of the medical and dental professions in anesthesia, and I feel sure that such action will maintain the standards and ethics of the specialty.

There are a number of ways in which those who are vitally interested in anesthesia may advance this art. To come into its own, the specialty must first of all continue its organization on broad lines that provide for local, regional and national associations. Active, enthusiastic and continued membership in these several associations is necessary for each and every anesthetist, if he really has at heart the advancement of his specialty and the conservation of his own status as a specialist. Good programs at the meetings are essential and all anesthetists who are making interesting and valuable researches should by all means prepare papers and request an opportunity for presenting their contributions. Nothing succeeds without the intensive co-operation of all concerned. Leaders are only those who assume responsibility for others and shoulder the work of putting some movement across but their greatest efforts come to naught unless supported by the rank and file.

Join and support as many societies of anesthetists as you possibly can and have every other anesthetist that you know of do the same. This is a vital necessity until the specialty has become so firmly established that it need no longer combat infringement of its prerogatives.

METHODS AND EQUIPMENT.

While you may have agents or methods of choice it is essential as a specialist, that you are able to use any and all anesthetics and employ any and all methods for their administrations. Do not delude yourself that your method of *open* ether is superior to so-called *closed* methods, if your results are not up to the standard. An apparatus that gives closed ether with oxygen and controllable rebreathing may in reality afford a more open etherization in the true sense of the word, than a simple mask surrounded by yards of gauze and a dozen towels. Are you expert enough to secure relaxation with nitrous oxid-oxygen *alone* or do you find it necessary to use relaxants? While primary and secondary saturation offer unique possibilities in the practice of the most expert, undoubtedly the concomitant use of minimal ether or anesthol-paraldehyde, or preliminary magnesium sulphate-morphin will remain the stand-byes of the majority. Such methods as endotracheal, endopharyngeal and colonic anesthesia offer many possibilities. The expert should have these methods well in hand. Many a practice has been built up on such preparedness.

Oxygenation.—It seems unnecessary to stress the importance of oxygenation before, during and after anesthesia with such rebreathing as will prevent over-ventilation. All too often following the use of ether and chloroform patients are left to rid themselves of the remnants of the anesthetic in their system. This is poor practice and oxygen rebreathing should be used for this purpose until patients are in rational control of all their faculties.

Mixtures.—It should not be forgotten, either, that such drugs as ethyl chlorid and such mixtures and combinations as anesthol, somnoform and various C-E mixtures should not be discarded from use on account of any theoretical criticism or objections. Developments would seem to point to a broadening field for the use of anesthetics in varied combinations.

Heat.—The question of using heat with anesthetics is still being debated but many anesthetists have entirely overlooked the real fundamental principle underlying this practice. The idea is not merely to warm the vapor but to *attenuate* it and bring its specific gravity as close to that of oxygen as is possible.

SAFETY-FIRST IN ANESTHESIA.

Are you taking part in the nation-wide safety-first movement in anesthesia originated by the National Research Society? If not, you are missing a valuable opportunity in placing your specialty upon its proper plane. This safety-first movement is based primarily on A. H. Miller's conception of determining the surgical risk of the patient by means of the blood pressure rules of Moots and McKesson. Once the surgical risk is known, are you in a position to examine the patient before the operation and have you the privilege of selecting the anesthetic and dictating preliminary medication? If not, you are in an awkward position with regard to practicing a specialty and the sooner you can convince your surgical associates, that your knowledge in these respects exceeds theirs and that your judgment is more to be relied upon, the sooner you will be recognized as a consultant. *To achieve this rank it devolves upon you to become proficient in making*

and in evaluating every possible method of differential diagnosis and it is in this respect that the anesthetist must be an all-around physician.

The safety-first movment further provides that you as an anesthetist must keep yourself and the operator informed as to the patient's condition throughout the entire operative period by continuous attention to all the signs and symptoms of anesthesia, as well as to the reactions of the patient which may indicate temporary or disastrous complications. In doing this, the more recent charting of signs and symptoms by Rutherford, McKesson, Guedel, Poe, Peebles and others are of material assistance and even more important than these, are the five minute blood pressure readings to determine if the patient is still in the zone of safety, or has entered one of the three degrees of circulatory depression. As these blood pressure readings predetermine the incidence of shock, they are more important in the prevention of this imperilling complication than all the other therapy at our disposal and the routine use of this chart or one of your own, that enforces the selfsame safety-first measures, will confer a great service upon your specialty. Then all patients should be watched postoperatively as to their blood pressure reactions.

FINANCIAL CONSIDERATIONS.

It would seem a poor fiscal policy to go on salary or to allow the hospitals or operators to collect your fee. At the present time those interested in the hospital domination of the practice of medicine are using the flat-rate charge and salaried employment to control and socialize the practice of medicine and all its specialties. Salaried positions are being used as part of a wedge game to get the anesthetists in the grip of hospital control, compel them to train nurses and then to let them out by reducing their income and establishing nursing anesthesia as the routine. Such methods must be fought to the last ditch or the specialty of anesthesia is doomed to annihilation.

There is every reason for charging an extra fee for difficult and prolonged anesthesias, especially when patients can well afford to pay, and under certain circumstances it is folly for an anesthetist to leave any one but himself in charge of the patient postoperatively when life hangs in the balance. Local societies of Anesthetists should have some understanding about uniform fees for similar service and should enforce this fee schedule in respect to corporation, workmen's compensation and other insurance cases.

NEWER DEVELOPMENTS.

Standardization in anesthesia is difficult because it involves not only the anesthetist but the operator and patient. It is difficult to arrive at any unanimous opinion regarding the use of any anesthetic or method of administration in the presence of certain complications. The all-around anesthetist is the one who wins out in this connection. It even seems to be becoming important that anesthetists should have a mastery of local and regional anesthesia, so that it may be used when conditions indicate or operators require it.

Opinion is very diversified regarding *anesthesia for tonsil operations* in the adult. It is becoming more and more certain that local anesthesia is not as safe as has been claimed and that the operative results are not as good under local as under general anesthesia. Only the most expert will be able to satisfy their operators with gas-oxygen anesthesia alone but such perfection in technic is worth striving for.

A very unique possibility has been developed by McKesson in the use of nitrous oxid-oxygen for *empyema operations*. After the operator has completed his work with the exception of closing up, it is the custom of McKesson to utilize the gases under pressure for rhythmical expansion of the contracted lung, thereby not only milking the pus from the thoracic cavity but also filling up the usual abscess area with inflated lung. This technic materially shortens the convalescent period of the patient.

The *toxic thyroid* may be handled under various methods of anesthesia provided the intense demand for super-oxygenation is met. Unless this is done thyrotoxic storms will follow any and all methods of anesthesia.

From the recent researches of Boebinger, of New Orleans, it would appear that *sudden death during operations for pharyngeal abscess* is not due to anesthesia or even to the inspiration of pus into the airway. There is an element of reflex inhibition due to the incision which as yet has not been satisfactorily explained.

Undoubtedly certain forms of anesthesia are safer for the patient in the presence of *diabetes and acidosis*. Nitrous oxid-oxygen vies with local anesthesia in this respect and ether should never be given under the circumstances, except with proper oxygenation. It must be remembered also that diabetes is a ketonuria and that its coma cannot always be anticipated on the basis of kidney function. Usually the breath-holding test is useful in determining the risk of the diabetic patient from anes-

thesia. The diabetic coma developing during or immediately after operation is essentially an edema of the medulla and should be treated by the methods which Fischer has devised for treating edema associated with other pathological conditions.

Perhaps no method of anesthesia affords such ease and comfort to both patient and anesthetist, in the presence of *marked obesity,* as *ether-oil colonic anesthesia* and this may be made more efficient by the use of paraldehyde or magnesium sulphate as elaborated by Gwathmey. The anesthetist should not delude himself however that colonic anesthesia is free from complications or fatalities. Its use requires an expert anesthetist as much as any other method.

Alcoholics, on account of the prolonged excitation induced by anesthesia, are prone to develop acapnia, and cyanosis abruptly gives way to the white waxy warning of *acapnia vera.* This must be guarded against.

Emphysematous conditions of the patient are usually due to the use of pressure during anesthesia, especially in the presence of a wound in the anesthetic area or following a rupture of air vesicles in the lungs.

It is coming to be realized more and more that all anesthetics may effect the heart. Thus Engstead and Corbett have shown that local anesthetics like cocain and its substitutes directly attack the bundle of His. Levine has shown that *heart block and paroxysmal tachycardia* may occur during or following anesthesia and Scholomovitz has indicated the effects of ether upon the primary pacemaker of the heart. Also the oculo-cardiac reflex is beginning to become prominent in surgical literature. Thus it is seen by far that the last word has not been spoken with regard to anesthesia in relation to the heart or cardiac pathology.

The *treatment of shock* is prevention but in spite of all precautionary measures it will occur during operation. When it does the anesthetist must realize that the shocked patient requires little or no anesthesia for the relief of pain but does require increased oxygenation on account of stasis or loss of the circulation. This applies particularly when hemorrhage is an added factor.

REPORTS OF COMPLICATIONS, ACCIDENTS AND FATALITIES.

The National Anesthesia Research Society has appointed a special committee on records and as these reports are to be kept confidential, it would seem most appropriate that all anesthetists should report anesthetic deaths to this committee with full details, and whenever possible these cases should be autopsied.

The question of *postoperative pneumonia* is developing researches along unusual lines and atmospheric conditions of temperature, pressure and humidity seem to play a part in its incidence, as well as sepsis, aspiration, certain operative procedures, chilling and edema, due to deoxygenation and too concentrated vapors.

Reports of *explosions under anesthesia* have been more frequent than usual. Some of these have been due to switching reducing gauges without the realization that oxygen may explode in the presence of small amounts of oil. Also it is becoming evident that gas-oxygen-ether in certain mixture and under certain conditions is a high explosive. Then are the electrical heating units on gas-oxygen machines altogether safe?

CONCLUSIONS.

In concluding I may mention with satisfaction, that at least one sovereign state through its legislature has limited the giving of anesthetics to licensed and qualified physicians and dentists and has prescribed a definite course and examination in anesthesia as one of the minimum requirements for license to practice. Anesthetists have the Northern and Southern California Societies of Anesthetists to thank for this revolutionary legislation.

With the aid of Dr. F. H. McMechan, in my own state, Colorado, we were able to kill in committee, a bill that was being amended to give nurses the legal right to administer anesthetics.

Although Dr. McMechan, with the assistance of the Ohio anesthetists succeeded in getting a bill repealing nursing anesthetists through the Senate and endorsed by the Ohio State Medical Association, the Cleveland advocates of nursing anesthesia refused to abide by the majority vote of the State Society and brought sufficient political pressure to bear, to prevent passage of the bill in the House during the last day of the legislative session. No doubt you have all read President Wells Teachnor's splendid and helpful announcement on Ohio's Policy on Anesthesia. Certain clinics, surgeons and hospitals are determined to put nursing anesthesia across and thus it will be seen that the anesthetists have a large legislative problem before them, if they wish to offset the activities of nursing anesthesia advocates; and unless political support and financial means are provided to make a legislative fight wherever required, it will be impossible to conserve anesthesia as an inviolable part of the practice of medicine. We must unite in doing this

through our Legislative Committee of the Associated Anesthetists.

I thank you for your indulgence and I hope that you will enjoy the scientific program and social activities that have been arranged for you.

117 WEST PITKIN ST.

IMMEDIATE AND REMOTE ILL-EFFECTS OF INSUFFICIENT OXYGEN DURING ANESTHESIA.*

EUGENE CARY, S.B., M.D.,
CHICAGO, ILLS.

It was with great pleasure that I accepted the invitation to read a paper before this society; for in doing so I shall endeavor to bring before you certain facts which to me seem to be of the utmost importance and upon which I have definite ideas.

ANESTHESIA MEANS ANOXEMIA.

I wish first to emphasize the fact that anesthesia means anoxemia (oxygen want) and then to show the effect produced upon the circulatory system and upon the alkali reserve in the production of an acidosis. Reimann[1] has proven that oxidation is diminished during anesthesia and states that interference with oxidation is so intimately associated with the anesthetic agent, that to prevent suboxidation is to prevent anesthesia. He found that there is an increase of acids in every patient anesthetized by ether, chloroform, and nitrous oxid, and even intraspinal anesthesia by stovain produced quite a marked increase of acids in one case which came under his observation. In 20 per cent of these cases *true acidosis* was produced.

THE IMMEDIATE AND REMOTE EFFECTS OF ANOXEMIA.

A. On the Circulation.—The immediate effects of anoxemia on the circulation are compensatory in nature. There is an effort on the part of the vasomotor mechanism to make up for the oxygen want by an increased blood pressure, an increased pulse pressure and by an increased pulse rate.

Concerning these points, exhaustive studies were carried out by the Medical Research Laboratory of the Air Service Division of Military Aeronautics[2]. Here men were put on the *Rebreather Apparatus,* in which the per cent of oxygen in the inhaled air was gradually reduced to the vanishing point and the findings recorded. A typical case is recorded as follows:

Oxygen Per Cent.	*Pulse Rate.*	*Pulse Pressure.*
19	114	34
17	104	30
15	110	40
12	114	42
10	120	55
8	126	64
7	135	65

Diastolic pressure gradually fell after 10 per cent oxygen was reached, while the systolic pressure gradually rose after 14 per cent oxygen. Collapse occurred when the percentage of oxygen was diminished to 6.5, when the subject became pulseless and all pressure fell to zero.

The slowing of the pulse to practically a standstill and the fall in blood pressure is central in origin or a cerebellar asphyxia, for, as pointed out by Greene and Gilbert[3], when both vagus nerves are cut the heart at once beats in rapid rhythm and with normal sequential beats.

Schneider and Sisco[4] found that the inhalation of any oxygen-rich mixture while on Pike'e Peak slowed the heart appreciably and diminished the blood flow through the hands. Similar observations were made at Mineola[5], in which the pulse rate was taken under 760 mm. barometric pressure and then in the low pressure chamber under 280 mm. pressure (or an approximate altitude of 18,000 feet). The normal pulse rate at 760 mm. was 73 per min., while at 280 mm. it was 92 per min.

The work of Major Whitney[6] has brought out the fact that under low oxygen pressure at the time of collapse there is marked dilatation of the heart. This condition has been recently noted in Major Schroeder, who ran out of his supply of oxygen in his flight that broke the world's altitude record. He sustained an acute dilatation of the heart that was demonsterable for over a period of two weeks.

B. On the heart.—The effects of exteme anoxemia on the heart were studied by Greene and Gilbert[7], using an electrocardiograph, and their conclusions are:

1. That reflex muscular control in the human may persist 6 to 8 seconds after loss of consciousness from anoxemia.

2. That sino-auricular rhythm is lost by steps, *first,* to a lower point in the sino-auricular system; *second,* to a point nearer the base of the ventricle, presumably the auriculo-ventricular node.

3. That internodal conduction is finally lost; a brief stage of reversed conduction terminating in

*Read before the Chicago Society of Anesthetists, January 23, 1922.

lengthening R-P intervals, preceding total loss of conduction.

4. That the ventrical rhythm is very persistent and unexpectedly regular during the late post-crises stage. In this case the equivalent rates are from 63 to 44, increasing 48 per minute in 10 seconds after removal of the mouthpiece.

5. That in man, lack of oxygen induces a series of changes in cardiac rhythm, in conduction and in suppression of auricular contractions quite parallel to similar phenomena established in experimental animals under general asphyxiation.

THE CARBON DIOXID CARRIERS OF THE BLOOD.

The arterial blood of man normally contains about 50 volumes per cent of carbon dioxid, the venous about 55 to 60. Acording to Van Slyke[8]:

"The carriers of carbon dioxid may be most simply described as substances which hold in combination alkali, of which they supply to the CO_2 as it enters the blood, sufficient to bind nearly all of it as alkali bicarbonate. When the CO_2 leaves the blood, they combine with their alkali again.

The chief carbon dioxid carrier of the blood is hemoglobin. It is almost as completely responsible for the transport of carbon dioxid in the blood as it is for the transport of oxygen. Of the alkali furnished to neutralize the CO_2 that enters the venous blood, from 80 to 95 per cent, sometimes possibly all, comes from the hemoglobin. Of such alkali, the greater part is set free when the relatively strong acid, oxyhemoglobin, is changed by loss of oxygen to the much weaker one, reduced hemoglobin. A smaller part of the alkali is furnished by the unchanged oxyhemoglobin, which is itself an efficient buffer at blood reaction. The relatively slight remainder is furnished by the other buffers, *viz.*, the phosphate in the cells, the proteins in the plasma and the bicarbonate.

The hemoglobin, from its location in the cell, is able to increase the alkali content of the plasma by withdrawing CL into the cells from the plasma NaCL, thereby leaving the Na to form $NaHCO_3$. The cells are also freely permeable to the H_2CO_3, so that the latter can enter them to combine with the alkali furnished by the hemoglobin, thereby decreasing the H_2CO_3 of the plasma at the same time that the CL shift increases its $NaHCO_3$."

THE IMMEDIATE EFFECTS OF ANOXEMIA ON THE ALKALI RESERVE.

Henderson[9] states that: "the functions of respiration are not only to allow combustion and the liberation of energy, but also, and of equal importance, to prevent acidosis." He discovered, in considering tissue respiration, that a muscle placed in pure hydrogen or nitrogen gas would react to stimuli, still under such conditions would develop a greater acidity and become fatigued more quickly; but that the acid substances would be rapidly destroyed (converted into CO_2) if the asphyxiated muscle were supplied with oxygen.

Likewise, under reduced oxygen pressure at high altitudes, acidosis develops and persists as long as the subject remains[10].

Oxidation is diminished during anesthesia, as shown in the experiments of Alexander and Cserna[11].

Reimann[1] has shown that there is always an increase in the amounts of acid substances formed during the period and as a result of anesthesia. This may result in a *compensated acidosis* or an *uncompensated acidosis,* which latter is a condition in which the bodily supply of alkali has been depleted to a point where symptoms occur; about 15 to 20 per cent of operative cases.

An analysis of the acids formed during anesthesia by Reicher[12] places them among the ketones and Reimann has observed that 60 per cent of the observed fall of carbon dioxid of the plasma is accounted for by the ketonic acids, estimated as acetone. To put it briefly, these acids are neutralized as they are formed, by the sodium bicarbonate and ammonia and the salts of these acids are then excreted and thus eliminated from the body.

The factors found that predispose to uncompensated acidosis are, briefly, impaired kidney function; diseases which drain the body of reserve alkali; (infectious processes and diabetes) the duration and depth of anesthesia; pre-operative purgation; and hemorrhage. Patients who show a low reserve before operation will always show a greater diminution in carbon dioxid combining power afterward.

Partial asphyxia induced by insufficient oxygen supply to the lungs, in all, but particularly in unskillful anesthesia, and the prolonged subminimal breathing following anesthesia, must bring about untoward effects, largely because of the insufficient supply of oxygen carried by the blood to the tissues.

THE SYMPTOMS ARISING FROM ACIDOSIS.

What are the remote effects arising from anoxemia and the resultant acidosis? On the heart, we have shown that when compensation ceases there is cardiovascular failure; concerning the situation in general, we find that patients suffering from uncompensated acidosis have more gas pains, more nausea and vomiting, more headache, more urinary disturbances and take more time to recuperate. This has been brought out forcibly by the works of Reimann[1],

Rose[13], Cary[14], and others. Graham[15] in his experiments on chloroform, liver necrosis, concludes that the damage was probably done by the halogen acids and that by administering alkali intravenously, the necrotic action is inhibited.

TREATMENT.

It has been noted in all this work that the carbon dioxid combining power of the blood after anesthesia is always reduced, therefore, the contention of Henderson, which is the giving of carbon dioxid after anesthesia, is of questionable value. The logical anesthesia is one which reduces to a minimum the asphyxia, fully meets the patient's oxygen need, and combats the acidosis by the proper administration of bicarbonate and carbohydrates before and after anesthesia.

30 NORTH MICHIGAN AVE.

THE BREATHING OF NEPHRITICS.*

BEAUMONT S. CORNELL, M.B., L.R.C.P., M.R.C.S.,
BROCKVILLE, CANADA.

It is the eperience of surgeons in general that patients with kidney lesions withstand operations less well than those in whom no renal disease exists. This is so impressively true that frequently the nephritis will dissuade the surgeon from offering the patient operative relief from the surgical condition present. Albuminuria of renal origin ought rightly to provoke a nice balancing of risk factors, since all too frequently this danger signal has been unheeded, and with disastrous results. When it is remembered how many advanced cases of nephritis show no albumin, a more elusive, and more dangerous element enters into our consideration.

ETHER AND ACIDOSIS.

Any serious enquiry into the reasons for nephritics poor tolerance for operation immediately leads the surgeon to consider the effects of general anesthesia, and it is in so doing that he hits upon the very kernel of the problem, since experience shows that when operations have been performed with the use of local anesthesia alone, no untoward nephritic reaction is manifested. In these days the unpopularity of chloroform removes it from serious attention, except for the remark in passing that it is condemned by the best judgment, from any use with nephritics. Nitrous oxid-oxygen anesthesia appeals to the writer as indisputably the general anesthetic of choice, but its employment is somewhat restricted by expense and as well as by the inexperience of the non-specialized anesthetist, who, after all, gives most of the anesthetics in any country. It is, therefore, with ether that the problem is generally connected; and it is especially in instances of *long, deep ether narcosis* that the nephritic reacts morbidly.

Even in normal individuals is it now established that etherization produces a mild degree of acidosis. In the individual with a renal lesion, it is observed how greatly this process is facilitated and how prone life is to be endangered thereby.

MECHANISM OF ACIDOSIS PRODUCTION.

The elucidation of the mechanism of acidosis production will succeed only when many recondite factors, chemical and serological, have been reduced to definite knowledge; and at present we merely know that etherization of nephritics does cause, at times, the syndrome of symptoms clinically labelled *acidosis.* The most evident symptom is *hyperpnea,* a rapid shallow respiration, unassociated with cyanosis, or distress. Its immediate cause is the disturbance of the blood's chemical balance, in favor of increased H-ion concentration, and this in turn is thought to depend upon temporary metabolic change invoked by the effect of ether on the bodily tissues.

In health the blood constantly controls its acid-alkaline balance, even under ether, but in the nephritic the *alkaline reserve* is weakened.

The writer's attempt to employ a direct means of estimating the H-ion concentration of the blood, led to the use of an improved Levy-Marriott-Rowntree apparatus by means of which readings of the actual H-ion concentration (Ph.) were made. With all the objections which might be raised to the method —and there are many, it nevertheless had a value in comparing relative concentrations in different individuals, or in the same individual under different circumstances. But the elasticity of the readings was hampered by a colorimetrical method, in which the color differences of the standard tubes, though optically slight, represented physiological differences of great magnitude. *For example,* a normal person's blood was Ph.=7.6, whereas the blood of a frankly uremic patient was Ph.=7.4, a difference only of .2. What smaller differences would, therefore, exist between normality and the mild acidoses of chronic nephritics, who are really the patients we desire to measure!

Moreover, the important factor to be determined is not the actual H-ion concentration, since being held to a pretty constant level even in disease, it can afford no valuable information. More important would be an estimation of the blood's alkali reserve, or, stated differently, the blood's *buffer capacity.* In

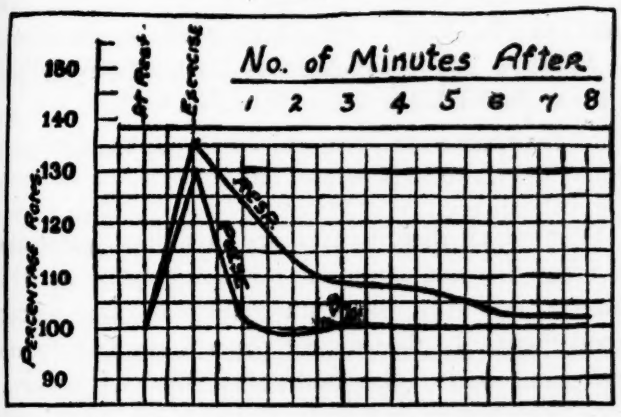
*Read before the Second Annual Meeting of the Canadian Society of Anesthetists, Royal Alexandra Hotel, Winnipeg, Canada, June 20-21, 1922.

the presence of an added amount of H-ions, does the blood quickly or slowly regain its usual balance? This is the practical point to be determined in estimating anesthetic risk in nephritics, but no instrument sufficiently simple for clinical purposes exists.

THE RESPIRATORY PULSE RATE.

However, as an attempt will now be made to demonstrate, the respiratory center of the brain is an extremely delicate instrument which is forced to reveal the changing acid-alkali state of the blood stream by which it is bathed. As the acid mounts, the respiratory rate increases, until, by increased ventilation, the balance is again obtained, when the respirations once more return to their former rate. The accompanying chart shows graphically the respiratory-pulse response to exercise in 100 cases of chronic nephritis. (Chart I.)

CHART I.



Average Respiration—Pulse response to exercise in 100 cases of early chronic nephritis. The rates are calculated to percentages of rest rates, which are taken as 100.

It will be seen that although the pulse rate returns to normal in the usual time, the respiratory rate keeps up for several minutes. The prescribed exercise (touching the floor ten times with knees unbent) may in reality be regarded as the injection of acid into the blood, since it is the carbon dioxid and lactic acid of muscular katabolism, which, by stimulating the respiratory center, causes rapid breathing. It is seen that the average chronic nephritic after such an acid injection, breathes rapidly for six or seven minutes. The hyperpnea has no relation to the heart in these nephritics, according to the opinion of a heart specialist, who examined them, but is due entirely to a lowered alkaline reserve.

CONCLUSIONS.

The writer has been using this *respiratory-pulse rate test* (Respiratory Index) for three years as a simple method of detecting the tendency to acidosis. If a patient, without cardiac or pulmonary lesion, remains hyperneic for longer than four minutes after exercise, acidosis is suspected. This clinical manifestation of acidosis may be discovered in incipient nephritis, two weeks before albumin is found in the urine and has therefore a diagnostic value. There are many cases of hyperna which do not respond to digitalis. Many of them will respond to sodium bicarbonate.

In many cases an acidosis can be prevented, or, once established can be cured by the oral administration of sodium bicarbonate. But there are almost an equal number upon whom the alkali has no observable effect whatever. These latter cases, who do not respond, ought to be subjected to as long a regime of low-protein diet as possible before etherization, since a rested kidney will understand better than we, how to deal with the obscure types of acidosis.

53 JAMES ST. E.

SOME UNUSUAL PHENOMENA FOLLOWING ANESTHESIA.*

J. E. H. ATKEISSON, M.D.,
CHICAGO, ILLS.

Because of the coincidence of unconsciousness following a short anesthesia a history of the case is essential and briefly is as follows:

Mrs. Eva M., aged 25 years, nationality Jewish, occupation housewife, was struck by an automobile and run over by a machine following, on the evening of October 2, 1921, and admitted to the hospital at 12:30 A. M., October 3, in a conscious condition; temperature 97°, pulse 114, respirations 30.

Superficial examinations revealed the following:—

Fracture of the right clavicle; abraisions over the latero-posterior aspects of both thighs; abrasions over various parts of both arms and face; pain in the lower part of the abdomen, radiating towards back.

These injuries were dressed, and patient made comfortable in bed until the following morning, when *x*-ray examinations were made revealng fracture of the right clavicle at the junction of the middle and outer third; fracture of the sternum, with displacement to the left; hemorrhage of the left chest; fracture of the rhamus of pubis and ischium, both sides, with considerable displacement on left side.

Patient was five and one-half months pregnant, and at 1:00 P. M. on October 4, was spontaneously delivered of a baby boy. Twelve hours after admission patient's temperature was 100°, pulse 108, respirations 34; she was resting quietly, with occasional pains in the limbs and abdomen. Twenty-four

*Read during the Joint Meeting of the American and Mid-Western Associations of Anesthetists, Hotel Jefferson, St. Louis, May 22-24, 1922.

hours after admission the temperature was 100°, pulse 122, respirations 34.

At no time during the first week after receipt of injury was the temperature above 100.4°, with pulse varying from 100 to 122, and respirations being 34; but all this time patient complained of severe body pains.

During the second week temperatures varied from 100 to 101°, with decrease in rate of pulse and respirations. Patient cried periodically, complaining of severe pains, more particularly in the right leg.

On the 5th the patient was put in a body cast without anesthesia, except morphin and scopolamin one hour before application of the cast.

On the 13th the temperature was normal, pulse 110, respirations 30, patient resting comfortably with an occasional period of pain necessitating morphin. From this date to November 9, temperatures were normal, with an occasional increase in pulse rate never higher than 114, the respirations varying from 20 to 28.

On the morning of November 10 patient was given 1/100 gr of atropin at 9:00 o'clock and brought to the operating room for removal of the cast and internal examination of the pelvis.

The cast was cut and ready to be removed when nitrous oxid-oxygen was started. Patient went under the anesthesia quietly, without any excitement, was lifted from the cast and put on cart for examination of the pelvis. During the examination she became greatly cyanosed and stopped breathing. Artificial respiration and administration of oxygen were necessary to resuscitate. Patient awakened in a delirium, and one hour after had rectal temperature of 102°, pulse 120, respirations 42; incoherent mumbling and crying continuously for 24 hours; involuntary evacuations of bladder and bowels; temperature dropping to 101°, per rectum; with only momentary conscious moments, and then complaining of extreme body pains.

Between November 13 and November 30 her temperature ranged between 100 and 104°, with variations in pulse from 92 to 145, and respirations from 30 to 54.

From December 1 to 23, inclusive, the temperatures were very high, at no time less than 102.4°, with an average of 103.4°, and a pulse rate of 156, respirations 60.

A number of blood counts were made, the first on October 3 showing 41,000 leucocyts; the second on October 10 showing 14,000 leucocyts, and others as low as 8,500, until she died.

Spinal fluid findings were as follows:

Color, colorless; transparency, clear; globulin test Ross-Jones and Nagouchi, negative.

Cell count: Five to six cells per cc. (Mil.)

Urinalysis at all times negative.

Patient died December 23 at 5:30 A. M. She was unconscious except for short intervals from the time of the administration 15 minutes in duration on November 10, to date of death.

Postmortem findings: Autopsy was made by the Coroner's Physician on December 24, with the following findings:

Pelvic peritonitis; extensive abscess in the right lobe of the liver; congestion of the spleen and pyemia.

No examination of the interior cranium was made.

1954 MILWAUKEE AVE.

THE SUSPENDED RESPIRATION TEST WITH PARTICULAR REFERENCE TO ITS VALUE IN DIAGNOSIS IN CASES OF TOXEMIA OF PREGNANCY.*

GILBERT FITZ-PATRICK, M.D., F.A.C.S.,
CHICAGO, ILLS.

Respiratory disturbances are common symptoms in many diseased conditions; and, except in cardiac trouble, but little diagnostic value has been placed upon them. In the present paper I propose to inquire into some of the conditions underlying respiratory disturbances, and their clinical value in estimating the nature and extent of certain diseases, with particular regard to what I shall designate, the *suspended respiration test.* Normal air contains about 20 per cent of oxygen, which fully suffices for normal breathing and allows a factor of safety of 5 or 6 per cent, as it is known that when no fatiguing work is to be performed breathing air containing 15 or 16 per cent of oxygen is not particular harmful to normal human subjects. The volume of air which can be inspired by a normal fully grown individual depends largely upon his flexible thoracic and diaphragmatic capacity. Hutchinson[1] was the first to investigate this so-called *vital capacity* which is defined as the total quantity of air which can be expired after the deepest possible inspiration. To measure vital capacity Hutchinson invented the spirometer.

In healthy normal individuals vital capacity varies considerably. Various investigators have found that normal vital capacity may be expressed in terms as a function either of the individual's height or of his body surface.

*Read during the Joint Meeting of the American and Mid-Western Associations of Anesthetists, Hotel Jefferson, St. Louis, May 22-24, 1922.

PYSIO-PATHOLOGICAL CONSIDERATIONS OF RESPIRATION.

There is some difference of opinion among physiologists as to what constitutes the exciting stimulant of the respiratory nervous center. Haldane and Priestley[2] are satisfied that it is the carbon dioxid content of the blood; Winterstein[3] and Hasselbalch[4] think that the essential factor is the hydrogen-ion concentration of the blood. It seems that the carbon dioxid content of the blood falls as the production of acids in it increases. As Haldane and Priestley show the excitability of the respiratory center may be affected by a lowering of the oxygen tension and also by an inadequate blood flow. Thus according to Haldane[2] the carbon dioxid in the alveolar air of the lung scarcely changes in amount even when the carbon dioxid content of the inspired air greatly changes. The arterial blood leaving the lungs is saturated with carbon dioxid at about the same tension it has in the lung alveoli. The most important fact then, as regards breathing, seems to be the value of the tension in the alveolar air, as the breathing responds to any change in it arising either from sources outside or within the organism, and from any conditions which disturb the condition of the blood before it is acted upon by the lungs.

A pathological or disordered condition of the respiration may be brought about by: —

(a) Mechanical means, such as alterations in the movements of the diaphragm and abdominal muscles.

(b) Anoxemia due either to diminution of oxygen supply to the lungs or to some pathological conditions in the lungs.

(c) Factors which increase acidity of the blood, *i. e,* pathological conditions of kidneys, liver, and heart.

(d) Neurosis affecting the respiratory center.

In general, it may be said that in all these conditions there is a decrease in normal vital capacity; and this decrease in vital capacity runs parallel to the clinical condition. Dyspnea is usually a prominent symptom and may be manifested in different ways.

I do not intend to go fully into a consideration of these factors. As regards (a) *the first group,* pain accompanying a bilateral or unilateral abdominal lesion reflexly produces a changed tonus in the rectus and other abdominal muscles on the side affected, which in turn produces rigidity of the diaphragm; this, as well as any changes in the intra-abdominal pressure affecting the diaphragm, alters the breathing capacity mechanically. Pulmonary, pleural, and subdiaphragmatic inflammatory conditions obviously affect vital capacity mechanically, as do also open wounds of the chest wall.

Under (b) *the second group,* comes any cause which prevents sufficient concentration of oxygen in the alveolar air with which to saturate the hemoglobin of the blood. This may be due to poor or rarefied air, or to clogging of the lung epithelium by direct disease so that oxygen cannot pass through it into the blood in the normal way.

Factors coming under (c), *the third group,* are those to which I wish to direct particular attention, as they are the causes which are constantly met with in clinical practice. They are the pathological conditions (in the kidneys, liver, heart and other organs) which react on the blood stream and thus react on the vital capacity.

DETOXICATING POWER OF THE LUNGS.

Before considering these factors, I wish to refer to some recent investigations of Roger[5] with regard to the lungs. By experimental investigation Roger found that the lungs, in addition to their purely respiratory functions, have other varied and complex functions in the organism. Roger shows that the lungs by direct oxidation are capable of directly lessening the toxic power of certain poisons. The lungs act in fact like the liver, but the mechanism is different. The liver action depends upon its glycogenic function, a glucoside being oxidized and eliminated in the form of glycoronic acid. In the lungs the oxidation is direct. *The detoxicating power of the lungs, and their capacity in arresting and destroying germs carried in the blood stream, is a new chapter in physiology, which has not yet been fully investigated or is not entirely understood, and I merely refer to it here to show that when the lungs are pathological, one of the defensive agents of the organism against intoxication or infection is disabled, with a resultant effect on respiration.*

The detoxicating power of the lungs just alluded to is of course in addition to their well known property of excreting carbon dioxid. Any tendency to the production of acidosis in the body is immediately compensated for by an increased respiration and a washing out of carbon dioxid.

The kidneys have the power of separating acids from their bases, excreting the acids, and saving the base so that it may again combine with and neutralize acids. In nephritis, the kidneys, like the lungs, make a compensatory increased effort in the excretion of acids to prevent acidosis in the blood. But when the pathological conditions are advanced, such as in a clinical uremia, and the excretory power of the kidneys is reduced to a minimum, for a more or less prolonged period, the symptoms of acidosis make their appearance in the organism. Thus, even with a normal diet, acidosis and a chain of results may

follow from a disabled kidney. It is evident that the pathological conditions in the liver may similarly lead indirectly to incomplete reduction of toxic substances.

It is no part of the present paper to deal with the many causes which may bring about pathological conditions in the lungs, kidney, and liver, leaving aside other excretory agencies and organs which directly or indirectly affect the quality of the blood. I am dealing only with their result, and the result in the blood of these pathological changes is a toxemic or acid condition, which may be more or less intense depending on the lesions causing it.

Now, as has already been said, one of the immediate consequences of such a vitiated condition of the blood is to affect the nature of the respiration. The carbon dioxid content of the blood falls as acids increase in the blood, hence the exciting stimulant of the respiratory center is affected, and the modus of breathing is changed. Any pathological condition, therefore, which results in acidosis or toxemia of the blood produces a more or less anoxemic condition and is reflected in the respiration by shallow dyspneic, or otherwise disordered breathing.

Similar results may of course follow when the vigor of the respiratory nervous center has been weakened by nervous strain, or by continuous anoxemia due to administration of an anesthetic, which shuts off a sufficiency of oxygen, or by toxic substances produced by infection or injured tissues. Anoxemia, no matter how produced, greatly hastens the onset of fatigue in the respiratory center and demonstrates the ease with which respiratory (center) exhaustion may be produced. The variety of means by which anoxemia is produced easily explains the frequency of shallow and other disordered types of breathing. A patient suffering from any diseased condition, which interferes with his getting a sufficient intake of oxygen, is bound to show disordered breathing as a prominent symptom.

Oxygen starvation means acidosis and even a slight increase in acid products is always dangerous in cases with hemoglobinemia, shock, cachexia, toxemia, cardio-renal changes, pulmonary lesions, pregnancy and other conditions in which metabolism is disturbed and the tendency is already towards acidosis. Such patients usually show cyanosis, hemoglobin deficiency, respiratory disorder, dyspnea or apnea, all due to increased difficulty of oxidation of the acid products of metabolism.

If disordered breathing is found it is at once an indication to the physician to seek for its cause by a process of exclusion if there is not sufficient clinical evidence pointing to an obvious cause. Kidney lesions are those most frequently observed.

THE BREATH HOLDING TEST.

Of the various clinical manifestations of respiratory disorders, *breath holding or suspended respiration* is the easist to observe and to evaluate. It is known that normal persons can, on an average, hold the breath for about 45 seconds. Strange[6] of Petrograd, investigating the conditions of the heart muscle in connection with anesthesia found that patients with a weak cardiac muscle could not hold the breath for more than from 10 to 20 seconds.

The test for breath holding is very simple. The patient, sitting at ease, takes a deep inspiration and closes the mouth, the nostrils being compressed with thumb and finger to avoid involuntary expirations, and while the patient holds the breath as long as possible the seconds are counted.

Strange also made observations of breath holding in a number of cases of chronic disease in which he found that the duration of the breath holding appeared to be abbreviated considerably and in about the same degree that acidosis is known to occur in these conditions.

Jones[7], investigating anoxemic conditions in connection with anesthesia and especially as regards the risk of anesthesia in different classes of patients, found that the breath holding capacity is lowered in a number of pathologic conditions. He gives the following examples of breath holding tests:

Condition.	*Duration of Breath Holding.*
Diabetes	16 seconds
Thyroid disturbances	10 to 25 seconds
Anemia	15 seconds
Tuberculosis	12 to 15 seconds
Sepsis	12 seconds

This voluntary respiratory suspension test should act as a warning to the surgeon and anesthetist in dealing with diabetics, cardiac and renal patients, as the degree of the suspension is a fair index of the degree of the risk. Jones remarks that nitrous oxid anesthesia is a general anoxemic condition, because the nitrous oxid excludes oxygen. The sub-oxygenating process begins in the pulmonary circulation where, owing to the supply of oxygen being cut off, the venous blood of the artery passes unchanged into the radicles of the pulmonary vein, causing more or less stagnation, which results in a general anoxemic condition.

THE BREATH HOLDING TEST IN OBSTETRICAL CASES.

I wish to report in addition the results of the respiratory suspension test in 871 obstetrical cases;

primiparas and multiparas of all ages, and including the various complications found before and subsequent to pregnancy.

1. The average parturient woman has a respiratory suspension test of 25 seconds.

2. The shortest suspension, 3 seconds, was found in a primipara, 44 years of age, weighing 180 pounds, who had a cardio-renal insufficiency, with general venous stasis, and who gave a history of *rose fever* in her younger life.

3. The longest suspension, 65 seconds, was found in a primipara 24 years of age, who holds the hurdling championship for girl athletes in her state.

4. The average cardio-nephritic pregnant woman had a breath holding test of 11 seconds.

5. Dividing the toxemias of pregnancy into two large groups, (a) the toxemias due to faulty function of the glands of *excretion* in pregnancy showed a test of 18 seconds; while (b), the toxemia due to faulty secretion in pregnancy, gave a test of 15 seconds.

Regarding the so-called vital capacity as determined by the spirometer, our records in 180 cases show a range from 60 cubic inches in a ductless gland toxemia of pregnancy to 190 cubic inches in a 11 para, with a chronic sinusitis at the sixth month. Her respiratory test was 35 seconds, while that of the toxemia case (60 cubic inches) was 14 seconds. *The average vital capacity in these* 180 *obstetrical cases was* 135 *cubic inches.*

CONCLUSIONS.

In conclusion it may be said that:

1. The average pregnant woman can hold her breath 25 seconds. Any reduction below this point demands an explanation.

2. The pregnant woman, who cannot hold her breath 15 seconds has an organic lesion, is a poor obstetro-surgical risk, and should be given an anesthesia only by a professional anesthetist, gas-oxygen being the anesthetic choice, and the individual oxygen need being determined and supplied.

22 So. Michigan Ave.

REFERENCES.

1. Hutchinson, J.: Respiratory Function with a View of Establishment of a Precise and Easy Method of Determining Disease by the Spirometer. *Medico-Chirurgical Transactions,* 1846, xxix, 137.

2. Haldane and Priestley: *Journal of Physiology,* London, 1905, xxxii, 225; idem, 1919, lii. 420-433; idem, 1916, lxiii, 60.

3. Winterstein: *Arch. f. d. Ges. Physiological,* 1911, cxxxviii, 117.

4. Hasselbalch: *Biochemische, Zeitschrift,* 1912, xlvi, 403.

5. Roger, H.: *Presse Médicale,* 1921, xxix, 793.

6. Strange: American Journal of Surgery (Anesthesia Supplement), October. 1914.

7. Jones, W. I.: American Journal of Surgery (Anesthesia Supplement), October, 1921.

SCOPE AND UTILITY OF THE THERAPEUTIC ADMINISTRATION OF OXYGEN.*

Alvan L. Barach, M.D.,
New York City.

In the long period of oxygen administration preceding the recent war the employment of haphazard or ineffective methods seemed responsible for the lack of faith in its therapeutic usefulness.† The extensive literature that is present, records favorable as well as purely negative results from its use. The occurrence of war gas poisoning led to a hurried demand for efficient treatment, and almost for the first time oxygen began to be administered effectively. The purpose of this paper is to demonstrate the utility of oxygen administration, to define its scope, and to discuss the method of administration.

RESULTS IN GAS POISONING.

We shall first note the results obtained in the treatment of gas poisoning. Where the Haldane apparatus could be used on the acute cases at the front it was frequently life-saving[2]. In the treatment of the chronic cases by oxygen chambers in England remarkable results were obtained by Bancroft[3], at Oxford, and by Shufflebotham[4], at Stokes. The gassed soldiers were relieved of palpitation, disordered action of the heart, insomnia, cough, expectoration, and mental depression; they showed in many cases a disappearance of polycythemia and an improvement in their previously poor cardiac and respiratory responses to effort. *These results constitute an instance where effective treatment with oxygen accomplished definite improvement and cure.* Shufflebotham and Sowry treated over 100 patients in their oxygen chamber, including several cases of pneumonia and pernicious anemia. The pneumonia patients showed an improvement, but in the cases of pernicious anemia a downward progress occurred after they left the chamber.

CLINICAL ANOXEMIA.

In discussing the laboratory evidence that forms the basis for the rational use of oxygen we shall first consider the degree to which anoxemia, or an abnormal lack of oxygen in the body, occurs in clincal disease. The introduction of the arterial puncture by Huerter[5], the development of convenient methods of blood gas analysis by Van Slyke[6] and by Haldane[7], the clinical investigation of Stadie[8], Harrop[9], and Meakins[10] resulted in the establishment of normal standards of oxygen saturation of the arterial blood and in the demonstration quantitatively of the anoxe-

*Read during the Joint Meeting of the American and Mid-Western Associations of Anesthetists, Hotel Jefferson, St. Louis, May 22-24, 1922.

mia present in pneumonia, cardiac insufficiency and emphysema. Means and Newburgh[11], and Lundsgaard[12] had already studied the oxygen of the venous blood. In normal people the arterial oxygen saturation is about 95 per cent; in cardiac insufficiency and its complications it may be between 95 and 75 per cent; in pneumonia between 95 and 60 per cent. The normal venous saturation is between 65 and 75 per cent; where a diminished blood flow is present, as in cardiac insufficiency, it falls below 65 per cent to a variable extent depending on the severity of the disturbance.

Since these figures demonstrate that a serve oxygen deprivation may occur in disease it becomes desirable to know what the effects of such anoxemia are. Mountain-sickness is a familiar example in which the symptoms are due to oxygen want[18]. Headache, nausea and vomiting, irrational states, and mental depression are common symptoms. In carbon monoxid poisoning, in which there is often a more abrupt and severe want of oxygen, the patients are usually comatose, have a feeble rapid pulse, and shallow rapid respiration. In these patients the anoxemia may have been so severe as to leave permanent damage to the central nervous system. A patient so exposed may in a half-hour of vigorous oxygen and carbon dioxid therapy become completely rid of CO and have all his hemoglobin fully saturated with oxygen[14]. Nevertheless, he may die one or two days later because of the damage the previous anoxemia created in his central nervous system. This explains why delay in the treatment of a marked anoxemia may result in irreparable injury. In experiments in which a lowered partial pressure of oxygen is breathed in chambers, the results are more easily controlled. Haldane [15], when exposed to a low pressure of oxygen became irrational and possessed of a fixed delusion.

In summary, it might be said that the disturbance of the gastro-intestinal system is manifested by nausea, vomiting, and diarrhea; the respiratory system by increased rate and depth of respiration or by periodic respiration, and later by rapid, shallow respiration; the circulatory system by a constant and progressive increase in pulse rate, and in the end by a fall in diastolic blood pressure[16] and cardiac failure; the central nervous system by headache, visual disturbances, irrational states and delirium, and finally, coma and death.

THERAPEUTIC EFFECTS OF OXYGENATION.

These effects then are the result of lack of oxygen, and it is with their prevention or relief by appropriate oxygen treatment that we are now concerned. By application of the methods of gas analysis to blood and by the successful development of the arterial puncture by Stadie, it was possible to compare the amount of oxygen in the blood before and after treatment with the symptomatic effect. Meakins[17] used the Haldane apparatus in cases of pneumonia, emphysema, and bronchitis, and showed that marked improvement in the clinical condition of the patient occurred as the arterial saturation was elevated to the normal. Stadie placed penumonia patients in a chamber containing between 40 and 60 per cent oxygen, and noted that with the removal or decrease in the arterial anoxemia, a decided improvement in the general condition of the patient occurred. Barach and Woodwell[19] used a mouth-piece rebreathing method in the treatment of patients with pneumonia and cardiac insufficiency, and made observations upon the oxygen and carbon dioxid contents of both arterial and venous blood. In the cases of pneumonia the arterial oxygen saturation was either elevated to the normal or much increased. In most of the severe cases definite clinical improvement could be seen. When edema of the lungs occurred as a complication, the prolonged use of oxygen seemed to avert a fatal outcome.

In cardiac insufficiency, when an arterial anoxemia was present due to passive congestion or edema in the lungs, the inhalation of oxygen raised the arterial saturation to the normal. When acute bronchitis or acute pulmonary edema supervened, the resultant arterial anoxemia could either be entirely removed, or much diminished. The improvement in the arterial blood could not always be determined by the degree of cyanosis, as at times progressive heart failure occurred and the stagnant anoxemia masked the improved oxygen saturation of the arterial blood. Obviously, the degree of cyanosis cannot always be used with safety to represent the arterial anoxemia. The venous saturation is needed to give the full picture. Clinical improvement could be seen in the treatment of the acute complications, but not in the chronic cardiac condition itself.

The venous saturation in both the cases of pneumonia and cardiac insufficiency showed an increase that was generally dependent on the increase of the arterial saturation, and merely raised the level at which the oxygen exchange took place. In a few cases there was a slight additional increase that may be explained on the basis of an improved blood flow or on the transfer of physically dissolved oxygen to the hemoglobin as the blood passes from artery to vein.

INDICATIONS.

We come now to the question when should oxygen be used. The essential indication for its employment seems to be acute anoxemia. The onset of abrupt want of oxygen indicates prompt treatment to avert the grave effects of severe anoxemia outlined in the beginning of this paper. Chronic anoxemia may indeed have ill effects, but its occurrence over long periods of time in patients with congenital or acquired heart disease and in people who have become acclimatized to high altitudes indicates that no very serious damage is produced.

In the recent Anglo-American expedition to the Andes all of the party felt poorly when they arrived at the high altitudes, and half of their number were confined to bed with symptoms of acute anoxemia. After a time they were able to do their investigative work, although more than half of them continued to have symptoms throughout their stay. The natives were also cyanotic, but none had the symptoms of mountain-sickness, their condition being that of chronic anoxemia. However, when anyone contracted pneumonia, white man or native, it meant practically certain death, unless he could be immediately rushed to the sea-level. It is thus apparent that although a chronic anoxemia may be present without symptoms, an acute anoxemia causes definite and perhaps grave injury.

Acute oxygen want occurs in a variety of conditions, among which may be listed: pneumonia, acute cardiac failure, severe hemorrhage, leathargic encephalitis, ascent to high altitudes, the complications of chronic cardiac insufficiency, pulmonary edema, acute bronchitis, carbon monoxid poisoning and nitrous oxid and other forms of anesthesia.

In acute carbon monoxid poisoning Henderson[14] found that the symptoms made a swift disappearance when a mixture of oxygen and 5 per cent carbon dioxid was inhaled. The hyperpnea caused by the carbon dioxid results in a quicker elimination of carbon monoxid and a quicker absorption of oxygen. As in this condition the acute anoxemia may be profoundly dangerous, anything which hastens the return to a normal oxygen content of the blood would appear to be eminently justified. Favorable results from carbon dioxid therapy after anesthesia and operation are also described by Henderson.[21]. The beneficial effects seem to depend on the "augmentation of breathing which rapidly ventilates the anesthetic out of the blood". The circulation is stimulated, increasing the venous return to the heart and raising the arterial pressure. There is, in addition, a marked decrease of postoperative nausea, vomiting and thirst. The employment of 5 per cent carbon dioxid has apparently not been harmful when judiciously used. Caution must be exercised, however, in its administration, as larger concentrations may be dangerous. Severe hemorrhage is attended by acute anoxemia of such an extent as sometimes to be the cause of death. Oxygen therapy may in these cases tide the patient over until transfusions can be given[22]. In acute cardiac failure and in the acute complications of cardiac insufficiency the use of oxygen may be of help.

DURATION AND FREQUENCY OF OXYGENATION.

The disease in which acute anoxemia occurs with the greatest frequency and with the greatest severity, is pneumonia, and it is here, therefore, that oxygen therapy is most indicated. The use of oxygen can be expected to remove or to diminish the ill-effects of acute anoxemia and in that way to improve the patient's chances of recovery and at times directly avert death. The clinical guide to its use is the presence of cyanosis. In pneumonia cyanosis has been said to run parallel to the degree of arterial anoxemia. Since the cyanotic color varies with the amount of reduced hemoglobin, a patient with a low hemoglobin may show little or no cyanosis even in the presence of marked arterial anoxemia. As Dready intimated, the parallelism between the arterial anoxemia and the degree of cyanosis rests upon the assumption that stagnant anoxemia is absent. This is generally true, as the blood flow in pneumonia, estimated by relative changes in the blood gases, appears to be either normal or increased[8 19]. Occasionally a failing circulation does occur with the production of cyanosis of venous rather than arterial origin. It may be stated as a general principle that cyanosis in pneumonia indicates the use of oxygen therapy until it has been removed, or if that is not possible, until it has been diminished.

The duration and frequency of administration are problems dependent upon the individual patient and the resources at hand. It would seem theoretically desirable to keep the patient free from cyanosis as many hours of the twenty-four as possible. In the very severe cases it may be necessary to give oxygen continuously. In the less severe cases, benefit may be derived from oxygen administered at frequently repeated intervals. The signs which should be kept track of and which usually reflect improvement are: (1) The degree of cyanosis. (2) The pulse rate. (3) The mental condition of the patient.

The degree of cyanosis is, with the exceptions already noted, the most trustworthy clinical guide in the oxygen treatment of pneumonia. Its alteration

under treatment may in addition furnish information of prognostic value. Severe arterial anoxemia has been shown to be an unfavorable sign[18]. If the administration of oxygen fails to remove the anoxemia or alleviate it only very slightly the prognosis, in our limited experience, is distinctly worse. Some benefit, however, may be derived from the increase in the oxygen physically dissolved. In cases in which a severe cyanosis is cleared up by prompt oxygen therapy, the prognosis is bettered in that the ill-effects of anoxemia may diminish or disappear and the patient be thus put in better condition to cope with the remainder of his disease.

A careful record of the pulse before, during and after oxygen therapy adds further data upon which to judge the effect of treatment. There is usually a distinct slowing in rate. In the severe cases this may be a very striking sign of improvement. In normal persons the inhalation of oxygen causes perceptible slowing of the heart [26 24], but in patients suffering from anoxemia the decreased rate is usually of much greater extent[19].

An additional effect that may result from the removal of anoxemia is a more alert and a clearer mental condition of the patient. The irrational states and delirium in pneumonia which may in part be due to the anoxemia, inasmuch as they are producible experimentally by withdrawal of oxygen, do not, however, promptly disappear, but seem to follow the clinical course of the disease. It may be that we are dealing here with the effects on long continued oxygen want, which as intimated above may persist even after their original cause has been removed.

METHOD OF ADMINISTRATION.

The method of administration still remains a great problem in oxygen therapy. *First* of all, it is necessary to provide an effective concentration of oxygen in order to expect good results. A mixture or air which contains between 40 and 60 per cent oxygen seems desirable. Less than 40 per cent may not be effective, and more than 70 per cent[26 27] may be harmful. The exact concentration theoretically required would be that amount precisely needed to remove the anoxemia. Practically, however, there seems to be no need for precision at the present stage of our knowledge. The *second* desirable feature of a good method is that it should produce no discomfort to the patient, or, if that is impossible, slight or temporary discomfort. *Thirdly,* where prolonged oxygen therapy is planned the economy of the method has to be considered.

It may be said at the outset that the inhalation of oxygen is the most logical avenue of administration, since it utilizes the vast absorbing surface of the lungs. Other methods, such as the intravenous[27] or subcutaneous[28] or rectal administration appear impracticable for prolonged therapy. Exceptions should be made in the case of infants, where the subcutaneous use of oxygen has apparently been successfully employed[28].

The oxygen chamber is the ideal way to treat anoxemia from the standpoint of effectiveness and comfort, but it is obviously impracticable for widespread use. Modern methods of administration known to us that yield effectively oxygen mixtures and that are available for common use are: The Haldane[29] apparatus involving the application of face mask, the Meltzer[1] oral insufflation apparatus, in which a metal tongue depressor is held in the mouth to conduct oxygen, the oxygen tent of Hill[30] which encloses the upper part of the patient in bed, a recent apparatus of Yandell Henderson[31] as yet unpublished, which also utilizes a face mask, and the mouthpiece rebreathing apparatus which we have used.[32] These methods, we believe, all yield an effective concentration of oxygen, but vary in their ability to secure comfort to the patient, and in the economy of operation. It should be added that in infants the nasal catheter may become an effective method because of their small oxygen consumption. The oxygen that enters the lungs through the small catheter contributes in this case a considerable increase of oxygen, whereas in adults it adds relatively so little as to relieve only the rather mild cases of anoxemia. Henderson has added the rubber mouthpiece to his apparatus for patients who will not tolerate the mask. In this method provision is made for the inspiration of a mixture of air and oxygen in the following manner: An amount of oxygen less than the tidal air is run into the collecting bag. During inhalation the oxygen in the bag is exhausted, whereupon an inspiratory valve connected with the outside opens and admits air until the inspired volume is made up. The exhaled air and oxygen is passed out through an expiratory valve. This method would, on the whole, appear to be very satisfactory, although we have not as yet had the opportunity of testing it.

In our apparatus rebreathing of oxygen was instituted to prevent wastage of the exhaled oxygen, an economy that is to a certain extent offset by the use of soda-lime. The interposition of the rubber tube between mouthpiece and soda-lime necessitates a little rebreathing of carbon dioxid. If the tube and metal connection are 47 cm. long, with a diameter of 1.2 cm., the interposed volume is 53 cc. The tidal

air in normal people is about 500 cc., and in pneumonia it is rarely below 250 cc.[18] Rebreathing carbon dioxid thus occurs to a slight extent and would tend to deepen respirations. It is possible that this action is beneficial in that it decreases the work of the pulmonary bellows by providing a more efficient ventilation. On the other hand, there is some evidence that difficulty in getting rid of carbon dioxid is frequently present in pneumonia[33]. The dead space would have no action as far as oxygen is concerned, as the entire circuit including the alveolar air would be filled with a high concentration of oxygen. The carbon dioxid would not be likely to accumulate to any serious extent, since the nose is left open, allowing free diffusion with the outside air. However, it seems on the whole preferable to interpose no additional dead space, and for that reason the apparatus has been modified by the insertion of an inspiratory and expiratory valve and another piece of tubing. The oxygen is thus passed through the soda-lime in a continuous circuit with no rebreathing carbon dioxid, an idea adapted from the Roth modification of the Benedict Portable Metabolism Apparatus. It is obvious that an expiratory valve could be used in place of the soda-lime, the apparatus then consisting of mouthpiece, expiratory valve, rubber tube, and collecting bag. The wastage of the exhaled oxygen would make it a more expensive method, but it would be very simple in operation. It would still possess the advantage of not unduly disturbing the patient, for in our experience the soft rubber mouthpiece caused only slight discomfort, whereas the face mask could rarely be borne because of the marked sense of suffocation it produced.‡

The Meltzer insufflation apparatus requires the constant presence of an attendant to turn the expiratory valve at each expiration and inspiration, and at the same time hold in place the metal tongue depressor that conducts the oxygen. We have had no personal experience with the method, but it does not suggest comfort for the patient, and it would appear a tedious task to operate it over long periods. The oxygen bed-tent represents a more complicated attempt to deal with the problem. In order for it to be successful, provision must be made to keep it from becoming warm and stuffy, and careful regulation of the contained oxygen and carbon dioxid must be carried out, as in an oxygen chamber, to render it safe. The bed-tent seems to offer great promise for a comfortable, effective method of administering oxygen, although at the present time it is hardly available for common use.

SUMMARY.

A review of the literature concerning oxygen therapy suggested that much of the skepticism concerning its value was due to ineffective methods of administration. In the treatment of war gas poisoning by efficient methods the results were decidedly favorable.

It is shown that the abrupt withdrawal of oxygen in clinical diseases or in human experiments causes injurious effects and that these effects can to a certain extent be prevented or removed by effectively administering oxygen. It has been shown by various investigations that the low content of oxygen in the blood of many cases of pneumonia can usually be raised to the normal level.

Pneumonia is the classical disease in which abrupt want of oxygen takes place, and it is thus in this disease that effective oxygen therapy is most needed.

The desiderata of an ideal method are discussed, and various modern apparatus mentioned.

33 EAST 68TH ST.

†The tube and funnel is the striking example of this type of "therapy". Meltzner[1] estimated that it added less than 2 per cent oxygen to the inspired air.

‡Since this apparatus has been used by others, several points have come up that are worth mentioning. The rubber mouthpiece as supplied is identical with that used in the Benedict Metabolism Apparatus. It has a wide margin which fits between the teeth and lips, and prevents leaks in respiration and experiments. For oxygen administration, however, the margins should be cut down considerably, as the comfort of administration is greatly increased. One-fourth of an inch margin opposite the upper and lower lips and one-half inch at the corners is usually satisfactory. At times patients hold the mouthpiece more comfortable when the margins are placed behind the teeth rather than between the lips and teeth. A water bottle interposed between tank and collecting bag tends to prevent drying of the back of the throat. It is good policy to let the oxygen bubble through the water bottle into the bag *continuously*, rather than to let the bag empty before refilling. This prevents the possibility of nitrogen in the exhaled air unduly accumulating, and ensures the breathing of a high concentration of oxygen. The collecting bag does not contain pure oxygen, since the exhaled nitrogen dilutes it slightly. The exact concentration of the mixture, if desired, can be obtained by withdrawing a sample from the attached stop-cock and analyzing it in a Haldane or other gas analyzer. We have recently constructed glass mouthpieces of the same shape as the rubber mouthpieces to alternate with the latter. By use of one or the other types of mouthpieces oxygen may be administered to almost all patients without real discomfort.

BIBLIOGRAPHY.

1. Meltzer, S. J.: Therapeutic Value of Oral Rhythmic Insufflation of Oxygen (*J. A. M. A.*), 69: 1150 (Oct. 6), 1917.

2. Douglas, C. G.: Dicsussion on Therapeutic Uses of Oxygen. *Proc. Roy. Soc. Med.* (*Sec. Therap. & Pharmacol.*), 13:59, 1920.

3. Barcroft, J., Hunt, G. H., and Dufton, D.: The Treatment of Chronic Cases of Gas Poisoning by Continuous Oxygen Administration in Chambers. *Quart. J. Med.*, 13:379, 1920.

4. Shufflebotham, F., and Sowry, G. H.: Discussion on Therapeutic Uses of Oxygen. *Proc. Roy. Soc. Med.* (*Sec. Therap. & Pharmacol.*), 13:59, 1920.

5. Huerter: Deutsch, *Arch. f. Klin. Med.*, 108:1, 1912.

6. Van Slyke, D. D.: Gasometric Determination of the Oxygen and Hemoglobin Blood. *J. Biol. Chem.*, 33:127, 1918.

7. Haldane, J. S.: New Apparatus for Accurate Blood Gas Analysis. *J. Path. & Bacteriol.*, 25:443, (Dec.), 1920.

8. Stadie, W. C.: The Oxygen of the Arterial and Venous Blood in Penumonia and its Relation to Cyanosis. *J. Exp. M.*, 30:215, 1919.

9. Harrop, G. A.: The Oxygen and Carbon Dioxid Content of Arterial and Venous Blood in Normal Individuals and in Patients with Anemia and Heart Disease. *J. Exp. M.*, 30:241, 1919.

10. Meakins, J. C.: Observations on the Gases in Human Arterial Blood in Certain Pathological Pulmonary Conditions and Their Treatment with Oxygen. *J. Path. & Bacteriol.*, 24:87, 1921.

11. Means, J. H., and Newburg, I. H.: Studies on the Blood Flow by the Method of Krogh and Lindbard. *Tr. Assn. Am. Phys.*, 1915, p. 51.

12. Lundsgaard, C.: Studies of Oxygen in the Venous Blood. *J. Exp. M.*, 27:179, 1918.

13. Haldane, J. S.: Recent Developments in the Therapeutical Use of Oxygen. *Contributions to Medical and Biological Research.* Dedicated to Sir William Osler. 1:550, 1919.

14. Henderson, Y.: Personal Communication and The Treatment of Carbon Monoxid Poisoning, Haggard, H. W., and Henderson, Y., *J. A. M. A.*, 77:1065, (Oct. 1) 1921.

15. Haldane, J. S., Kellas, D. M., and Kennaway, E. L.: Experiments on Acclimitization to Reduced Atmospheric Pressure. *J. Physiol.*, 53:181, (Dec.) 1919.

16. Lutz, B. R., and Schneider, E. C.: Circulatory Responses to Low Oxygen Tension. *Am. J. Phys.*, 50:237, 1921.

17. Meakins, J. C.: Therapeutic Value of Oxygen in Pulmonary Lesions. *Brit. M. J.*, 1:234. 1920. Also (10) above.

18. Stadie, W. C.: The Treatment of Anoxemia in Pneumonia in an Oxygen Chamber. *J. Exp. Med.*, 35:337, 1922.

19. Barach, A. L., and Woodwell, M. M.: Studies in Oxygen Therapy, I. In Cardiac Insufficiency and Related Conditions. II. In Pneumonia and Its Complications. *Jour. A. M. A.*, 28:367-420, 1921.

20. Harrop, G. A.: Personal Communication.

21. Henderson, Y., Haggard, H. W., and Corburn, R. C.: The Therapeutic Use of Carbon Dioxid after Anesthesia and Operation. *J. A. M. A.*, 74:783, (March 20) 1920.

22. Ryle: Discussion on Therapeutic Uses of Oxygen. *Proc. Roy. Soc. Med.* (*Sec. Therap. & Pharmacol.*), 13:59, 1920.

23. Smith, H. A.: The Effect of Oxygen Inhalation on the Pulse. *Med. Rec.*, 1:481, 1871.

24. Benedict, F. G., and Higgins, H. L.: Effects on Men at Rest of Breathing Oxygen-rich Gas Mixtures. *Am. J. Physiol.*, 28:1, 1916.

25. Karsner, H. T.: The Pathological Effects of Atmospheres Rich in Oxygen. *J. Exp. M.*, 23:149, 1916.

26. Flack, M., and Hill, L.: Textbook of Physiology. 1919, p. 303.

27. Tunnicliff, F. W., and Stebbing, G. F.: Intravenous Injection of Oxygen. *Lancet*, 2:231, Aug. 19, 1916. J. J. A. McMillan, U. S. Nov. M. Bull., 13:88, Jan. 19, Ibid, 11, 191, April 17.

28. Stuertz, E. Z.: Diatet. In Physik. Therap., 7:67, 159, 1903.

Naessens, W. M.: Subcutaneous Injection of Oxygen, Nederlandscher, Tydschr. V. Genesk., 1:410, (Jan. 22) 1921.

Bayeux, R.: Subcutaneous Injection of Oxygen in Influenze. Bull de L'Acad. de Med., p. 176, 1922.

Howitt, H. O.: Subcutaneous Injection of Oxygen. *Canad. M. Ass. J.*, 4:983, 1914.

29. Haldane, J. S.: Therapeutic Administration of Oxygen. *Brit. M. J.*, 1:181, 1917.

30. Hill, L.: A Simple Oxygen Bed Tent and its Use in a Case of Edema and Chronic Ulcer of the Leg. *J. Physiol.*, 50 (May 24), 1921. *Proc. Physiol. Soc.*, p. 20.

31. Henderson, Y.: Personal Communication.

32. Barach, A. L.: O Simple Apparatus for Administering Oxygen. *J. A. M. A.*, 78:334, (Feb. 4) 1922.

33. Means, J. H., and Barach, A. L.: The Symptomatic Treatment of Pneumonia. *J. A. M. A.*, 77, 1217, 1921; also Barach, A. L., Means, J. H., and Woodwell, M. N.: The Hydrogen Ion Concentration and Bicarbonate Level of the Blood in Pneumonia. *J. Biol. Chem.*, 50:431, 1922.

American Journal of Surgery

QUARTERLY SUPPLEMENT *of* ANESTHESIA *and* ANALGESIA

Surgery Publishing Co.

J. MacDONALD, Jr., M.D., President and Treasurer

15 EAST 26TH STREET - NEW YORK, U. S. A.

Original Articles, Clinical Reports and Experimental Researches on the Theory and Practice of Anesthesia and Analgesia, as well as pertinent Society Transactions, are solicited for exclusive publication in this Supplement. Typewritten Manuscripts facilitate Editorial Revision and avoid errors.

Subscribers Changing Address should immediately notify the publishers of their past and present locations.

Half-tones, Line-etchings and other Illustrations will be furnished by the Publishers when Photographs or Drawings are supplied by the Author.

F. HOEFFER McMECHAN, A.M., M.D., *Editor*

Avon Lake, Ohio, U.S.A.

JANUARY. EDITORIALS. 1923

A PLEDGE OR NOT A PLEDGE.

The Fellowship pledge of the American College of Surgeons reads as follows:—

"In particular I pledge myself to regard scrupulously the interests of my professional brothers, to shun dishonest money-seeking and commercialism, and secret money trades."

In the October, 1922, issue of the Anesthesia Supplement devoted to Society Proceedings will be found several Resolutions passed by various Associations of Anesthetists calling the attention of the American College of Surgeons to the fact that the exploitation of nursing anesthesia by some of its reputed leaders is a violation of the Fellowship Pledge.

Under the smoke screen of hospital standardization some propagandists in the American College of Surgeons have been making an effort to deny acceptable standards in anesthesia to certain hospitals in order to supplant medical anesthetists with nurses. The specious plea has been made that the use of a medical anesthetist means fee-splitting, and yet when the nurse is introduced into anesthesia, she is paid a nominal salary, sometimes amounting to 35 cents an anesthetic, while patients are charged the usual professional rates of fees, and the hospitals or surgeons involved pocket the balance.

This state of affairs is certainly a violation of the Fellowship Pledge, if it means anything, since it employs the boycott and lockout against professional brothers and involves dishonest money-seek-

ing and commercialism and secret money trades.

In most instances the nursing anesthesia is so poor a substitute for professional anesthesia that the former becomes a practice of securing money under false pretences, and when the public gets wise to this situation surgery is going to have a lot of explaining to do.

Nursing anesthesia is finding itself decidedly on the defensive, as the following letter will indicate:

THE LAKESIDE HOSPITAL
CLEVELAND

May 25, 1922.

My Dear Dr. ————,

I am trying to collect an anesthetic series of work done by nurse anesthetists. In this connection might I ask you to cooperate by sending me the number of gas anesthetics you have given and the fatalities that have occurred in the series? By fatality I mean, of course, death that is directly attributable to the anesthetic.

I am doing this because this Fall the Association of Anesthetists is going to have its meeting in Columbus, and I think it very possible there will be a renewal of agitation against the nurse anesthetist. I think it might be a convincing thing if we could publish about that time statistics collected from different nurse anesthetists and in that way show how safe the work done by the nurses is.

I shall be very glad indeed for your help in this matter, and will appreciate having the material at your earliest convenience.

With kindest regards,

Sincerely yours, .

ACH:HS (*Signed*)

AGATHA HODGINS.

To begin with, those who used the war emergency to bolster up the propaganda for nursing anesthesia, were responsible for the holacaust that resulted from the wounded doughboys being submitted to anesthesia by orderlies, hospital corpsmen and two-weeks trained nurses, while those in authority refused to commission hundreds of medical and dental experts for life-saving anesthetic service.

To show the sort of nursing anesthesia that is being produced at The Lakeside Hospital, the Editor wishes to recount the following personal experience:

Very recently an intimate friend of the Editor required an operation for a very small fibroid, but on account of previous hemorrhages, the patient was badly exsanguinated and the Editor warned her to have one of the most noted dental anesthetists of Cleveland give her the anesthetic—nitrous oxid-oxygen with a high percentage of oxygen. However, the patient allowed herself to be persuaded to accept the services of a Lakeside trained nurse, although the noted dental anesthetist was in the hospital the morning of the operation. The inhaler was adjusted Lakeside fashion and the exhaling valve screwed down and a gauze wipe wound round the opening that was left. At no time during the operation, which lasted one hour and a quarter, was more than seven per cent oxygen given and 5½ ounces of ether were used by this intensely closed method along with the gas-oxygen. In consequence, the patient came off the table in profound shock, and was 48 hours in recovering full consciousness and vomited from the effects of the anesthetic for one solid week. And yet this patient was told that this nurse was the most expert anesthetist in Ohio.

Figures on postoperative pulmonary complications collected and tabulated by Decker from 7 of the largest clinics using nursing anesthesia show an incidence of 1 serious respiratory complication in at least every 60 odd cases and 1 death in every 200 cases. These figures are borne out by the statistics of the small hospital clinic, in which the incident already related occurred. Not over 300 operations have been performed there under nursing anesthesia, with 7 serious respiratory complications and 1 pneumonia death.

In contrast Aikenhead, at the recent meeting of Canadian Anesthetists at Winnipeg, presented the following pertinent statistics. In 7,600 operations at the Winnipeg General Hospital performed during the previous year, there had been 19 postoperative respiratory complications (1 in 400 cases) and 4 deaths (1 in 1900 cases). All the anesthetics at the Winnipeg General Hospital are given by medical anesthetists.

It is certainly a strange situation when anesthesia, having for years been recognized as a specialty of medicine and surgery by the International Congresses of Medicine and Dentistry, the Royal Society of Medicine, the British Medical Society, the American Medical Association, the Canadian Medical Association, the American Dental Association, and having achieved a nationwide regional organization, should have to contend with this questionable campaign on the part of some false leaders in the American College of Surgeons to take anesthesia from the profession of medicine and dentistry and commercially exploit it by a new form of peonage in nursing, with disastrous results to suffering humanity and the demoralization of the advancement of the physiological era of surgery. Whom the gods would destroy they first make mad!—McM.

1923—MEETINGS—1923.

The N. A. R. S. Congress and the Organizaion Meeting of the Southern Anesthetists were most successful and closed a year replete with achievements for anesthesia. The coming year offers even brighter prospects for the development of the specialty. The campaign of education and regional organization will go on with undiminished vigor.

The Canadian Anesthetists will meet with the Canadian Medical Association at the Mount Royal Hotel, Montreal, June 12-14.

The American and Pacific Coast Anesthetists will meet during A. M. A. Week at the Hotel Stewart, San Francisco, June 25-27.

Plans are under way for holding another Congress of Anesthetists at the Auditorium Hotel, Chicago, October 22-24, during the Clinical Congress of Surgeons. It is expected that the N. A. R. S., Interstate and Mid-Western Anesthetists will join forces in making this Congress another milestone in the progress of anesthesia.

The Southern Anesthetists will meet with the Southern Medical Association, in Washington, D. C., November 12-14.

Thus it will be seen that anesthesia will challenge attention in four of the greatest metropolitan centers of North America, and if the Associated Anesthetists will only avail themselves of these opportunities for advancement the results for themselves and the specialty will exceed their most sanguine expectations. —McM.

Newer Apparatus

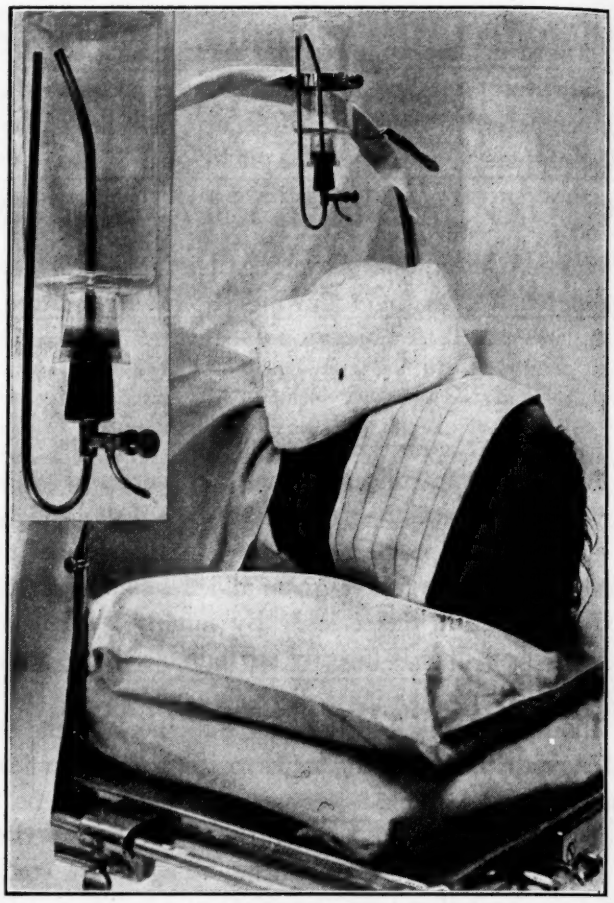
A NEW ETHER DROPPER.

LYMAN G. BARTON, M.D., F.A.C.S.,
PLATTSBURG, N. Y.

This dropper was designed for the purpose of administering ether by the open drop method and is so constructed that the drop rate can be accurately controlled to give any desired air-ether vapor mixture. The flow of ether at any specified drop-rate is perfectly uniform and, as a consequence, the air-ether vapor ratio does not fluctuate.

By being able to control accurately proportion of ether vapor to air in the mixture, and to alter it at will, any degree of anesthesia may be obtained and maintained at a constant level. We can thus obviate, in a large measure, the lack of uniformity in the vapor-air ratio, which otherwise may cause the mixture to be at times *too weak* for anesthetic purposes, or *too concentrated*, giving rise to irritation of the mucosa of the air passages with hypersecretion of mucus, cough, embarrassment of respiration and other undesirable complications as a result. Ether administered by this method, with a drop-rate control, gives an even anesthesia with an appreciable reduction in the amount consumed.

The dropper is relatively simple in construction and consists of a standard, round four-ounce bottle, a rubber stopper with a central perforation, carrying an air vent tube, a passageway around the air vent tube leading to a needle valve, and an exit nozzle for the ether drops. The needle-valve controls the rate of flow in drops, and this rate remains constant for any valve setting.



For prolonged operations, where holding the dropper over the face mask becomes more or less fatiguing, a stand is furnished to which the dropper may be attached in any position. The stand consists of a base plate, which is placed on the table under the patient's head, and which has attached to it at the sides a vertical wire frame that is adjustable in height. A suitable clamping device secures the dropper to the frame. The stand also furnishes a means of isolating the etherizing apparatus by draping with the laparotomy sheet or with towels as desired, and its use leaves both hands free for taking blood pressure, controlling patient's head or manipulating table.

The dropper is equally well adapted for chloroform or any of the alcohol-chloroform-ether mixtures, and especially commends itself for use by the general practitioner in obstetrical work and minor surgery, where the more cumbersome and complicated types of apparatus are not practical.

The dropper and stand are made by George Tiemann & Co. of New York.

Society Proceedings

CANADIAN SOCIETY OF ANESTHETISTS—SECOND ANNUAL MEETING.

The Canadian Society of Anesthetists held its Second Annual Meeting in conjunction with the Canadian Medical Association, June 20-21, 1922, at the Royal Alexandra Hotel, Winnipeg, Canada, under the Presidency of Col. William Webster, D.S.O., M.D. The gavel, a beautifully engraved gift to the Society, was presented by the retiring First President, Dr. Samuel Johnston. The Address of Welcome was delivered by Sir James Aikins, Lt.-Governor of Manitoba.

The minutes of the Niagara Falls Meeting and the Treasurer's report were accepted as read. The following were elected to membership: Drs. D. C. Aikenhead, Winnipeg; Geo. E. Beckman, Jacksonville, Fla.; Mary E. Botsford, San Francisco; H. M. Cameron, Winnipeg; Morris H. Clark, Kansas City, Mo.; R. H. Ferguson, East Orange, N. J.; P. J. Flagg, New York City; A. J. Slater, Winnipeg; Mary Gage Day, Kingston, N. Y.; M. S. MacDonald, Sher-

brooke, Que.; C. W. Reeves, Atlanta, Ga.; H. E. Reid, Toronto, and W. E. Saunders, Calgary.

The following scientific program was presented: President's Address, William Webster, Winnipeg; The Reaction of the Blood in Reference to Regulation of Respiration and the Influence of Anesthesia Thereon, A. W. Downs, Edmonton; Eleven Years Observation of the Minute Volume of Respiration in Anesthesia, with a Discussion of Some of the Factors Influencing the Same, E. I. McKesson, Toledo, O.; Studies of Acidosis in Anesthesia, H. G. Barbour, R. L. Stehle and Wesley Bourne, Montreal; The Breathing of Nephritics, B. S. Cornell, Brockville, Ont.; Postoperative Pulmonary Complications in 7,000 Cases of Anesthesia, D. C. Aikenhead, Winnipeg; The Induction of Nitrous Oxid Anesthesia, J. A. Heidbrink, Minneapolis; Anesthetic Properties of Pure Ether, R. L. Stehle and Wesley Bourne, Montreal; Newer Trends in Anesthesia, F. H. McMechan, Avon Lake, O.; The Welfare of the Surgical Patient, J. A. Slater, Winnipeg; On the Teaching of Anesthesia to Medical Students, W. B. Howell, W. G. Hepburn and Wesley Bourne, Montreal; Nitrous Oxid-Oxygen Anesthesia in Nose and Throat Surgery, E. I. McKesson, Toledo, O.; and Development of Anesthesia Service in the Hospital, Eleanor Seymour, Los Angeles.

Anesthesia clinics to show the latest methods and demonstrations of newer apparatus were held at the Winnipeg General Hospital.

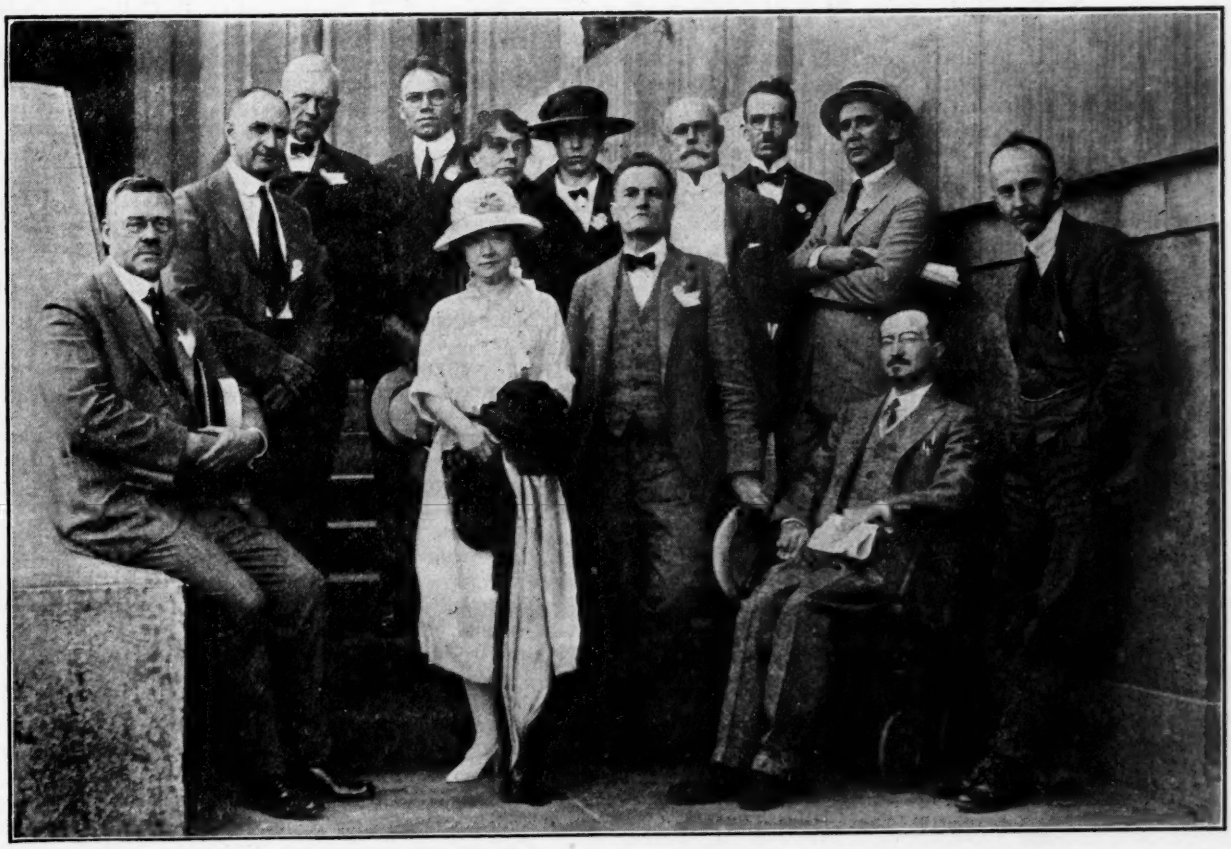
During the final Executive Session it was decided to await the result of a legal survey of Canada previous to entering upon an effort to eliminate nursing anesthesia and restrict the administration of anesthetics to licensed and qualified physicians.

The following officers were elected for 1923: D. H. Arnott, London, President; W. L. Muir, Halifax, Vice-President; F. H. McMechan, Avon Lake, O., Executive Officer for the United States; H. E. G. Boyle, London, Eng., Executive Officer for Great Britain; Wesley Bourne, Montreal, Secretary-Treasurer; J. E. Blazard, Edmonton, W. G. Hepburn, Montreal; H. J. Shields, Toronto, and Don A. Warren, Hamilton, Executive Committee.

The Visiting Ladies were entertained at garden parties at the homes of Mrs. Rogers and Mrs. Montgomery, at luncheon at the Country Club, and at a reception and dance at Parliament Buildings in honor of Lord and Lady Byng of Vimy, and at a musicale at the home of Mrs. Harvey Smith.

The last night of the meeting the anesthetists and their wives were the guests of Dr. and Mrs. McMechan at dinner.

The Canadian Anesthetists will hold their Third Annual Meeting with the Canadian Medical Association at the Mount Royal Hotel, Montreal, June 12-14, 1923. Those interested in attending and presenting papers are requested to get in touch with Dr. Wesley Bourne, Secretary, 34 St. Mark St., Montreal, as soon as possible.



Officers and Local Committee of the Second Annual Meeting of the Canadian Society of Anesthetists, at Winnipeg, June 20-21, 1922: (Lower Row) Samuel Johnston, Toronto; Mrs. F. H. McMechan; Wesley Bourne, Montreal; F. H. McMechan, Avon Lake, O.; K. G. Grant, Winnipeg; (Upper Row) J. A. Slater, Winnipeg; G. W. Judson, Lyn, Ont.; D. C. Aikenhead, Winnipeg; Eleanor Seymour, Los Angeles; Edith McKay Ross, Winnipeg; Wm. Webster, Winnipeg; Don A. Warren, Hamilton, Ont.; T. R. Hanley, Toronto.

Quarterly Index

of the Current Literature of Anesthesia and Analgesia

ALKALOSIS, DANGERS OF. Editorial. Journal American Medical Association, October 14, 1922.

ALKALOSIS AND TETANY, SUPPOSED RELATION BETWEEN. I. Greenwald, New York Journal of Biological Chemistry, October, 1922.

ANALGESIA IN CHILDBIRTH, HYPNOTIC. H. Kogerer, Weiner Klinische Wochenschrift, June 8, 1922.

ANALGESIA, SYNERGISTIC. F. Smythe, Memphis. Tennessee State Medical Journal, June, 1922.

ANALGESIA, SYNGERISTIC. J. T. Gwathmey and J. Greenough, New York. American Journal of Surgery, Anesthesia Supplement, October, 1922.

ANALGESIA, SYNGERISTIC, CLINICAL OBSERVATIONS ON. J. M. Rector, Jersey City, N. J. American Journal of Surgery, Anesthesia Supplement, October, 1922.

ANESTHESIA, SYNGERISTIC, MAGNESIUM SULPHATE AS AN AID IN. G. T. Tyler, Greenville. South Carolina Medical Association Journal, June, 1922.

ANESTHESIA IN CHILDREN, SAFEST METHODS AND AGENTS. Frances E. Haines, Chicago. Illinois Medical Journal, September, 1922; and Current Researches in Anesthesia and Analgesia, October, 1922.

ANESTHESIA COMBINED. Charles Ryan, Des Moines. Journal Iowa State Medical Society, May, 1922.

ANESTHESIA FOR DIATHERMY OF MALIGNANT TUMORS OF THE PHARYNX AND LARYNX. F. J. Novak, Jr., Chicago. Illinois Medical Journal, April, 1922.

ANESTHESIA, GENERAL, FACTORS INFLUENCING. R. S. Adams, San Antonio, Texas. American Journal of Surgery, Anesthesia Supplement, October, 1922.

ANESTHESIA, GENERAL, FOR OPERATIONS ON THE NASO-PHARYNX. J. Tarneaud. Paris Medical, August 26, 1922.

ANESTHESIA, GENERAL, AVOIDANCE OF PULMONARY ABSCESS WITH, IN NOSE AND THROAT SURGERY. J. T. Gwathmey. New York State Journal of Medicine, September, 1922.

ANESTHESIA, ITS USE AND ABUSE. Murray Jacobs, New York City. Medical Times, September, 1922.

ANESTHESIA INFLUENCE ON REACTION OF BLOOD IN REFERENCE TO REGULATION OF RESPIRATION. A. W. Downs, Canadian Medical Association Journal, September, 1922.

ANESTHESIA AS A PHENOMENON OF OXYGEN WANT. C. W. Greene, Columbia, Mo. Current Researches in Anesthesia and Analgesia, August, 1922.

ANESTHESIA, SUPERENAL GLAND IN. J. F. Corbett, Minneapolis. Journal American Medical Association, August 12, 1922.

ANESTHETIC RISK, QUANTITATIVE URINARY DETERMINATIONS WITH REFERENCE TO TOXEMIAS AND. Clifford Mitchell, Chicago. Current Researches in Anesthesia and Analgesia, August, 1922.

ANESTHETICS, THE USE OF. E. v. der Porten. Zentralblatt für Chirurgie, June 10, 1922.

ANESTHETICS, GENERAL, EFFECTS OF ON THE LIVER. C. LaRoque, Montreal. Canadian Medical Association Journal, August, 1922.

ANESTHETIST, OBSERVATIONS OF AN. Boris Rapoport, Boston. American Journal of Surgery, Anesthesia Supplement, October, 1922.

ANESTHETIST, RELATION OF THE SURGEON TO. S. T. Pope, San Francisco. California State Journal of Medicine, November, 1922.

APPARATUS—A NEW HEAD REST FOR SUBOCCIPITAL CRANIOTOMY AND CERVICAL LAMINECTOMY. Byron Stockey, New York City. Journal American Medical Association, September 2, 1922.

ATROPIN GROUP, TOXIC BY-EFFECTS OF THE. R. M. Waters, Sioux City, Ia. American Journal of Surgery, Anesthesia Supplement, October, 1922.

BARBITAL AS AN ANESTHETIC FOR DOGS. A. L. Tatum and E. Parsons, Chicago. Journal of Laboratory and Clinical Medicine, October, 1922.

BLOOD FROM THE CAPILLARY, EFFECT OF DEEP NARCOSIS ON COLOR OF. Rost and Ellinger. Münchener medizinische Worchenschrift. May 22, 1922.

BLOOD CATALASE, EFFECT OF REPEATED ADMINISTRATION OF ANESTHETICS ON. W. E. Burge. Urbana, Ill. Journal American Medical Association, August 12, 1922.

BLOOD VOLUME AND HEMORRHAGE, STUDIES IN. R. Gesell, E. Blair, R. T. Trotter and C. A. Moyle. Berkeley, California. American Journal of Physiology, August, 1922.

BLOOD VOLUME, INFLUENCE OF ANESTHESIA ON RESTORATION OF. A. E. Boycott and C. P. Jones. Journal of Pathology and Bacteriology, July, 1922.

BREATH HOLDING TEST, DIAGNOSTIC AND PROGNOSTIC VALUE OF. F. H. McMechan. Avon Lake, O. California State Journal of Medicine, November, 1922.

CHLOROFORM AND PITUITRIN, MAINTENANCE OF OBSTETRIC ANESTHESIA BY MEANS OF. A. F. Martin. British Medical Journal, October 14, 1922.

CHLOROFORM ANESTHESIA IN THE TROPICS. B .P. Hurtado. Gaceta Medica de Caracas, January 15, 1922.

DEATH—FATAL COCAIN POISONING IN ADDICT. M. A. Mancini. Revista Critica di Clinca Medica, April 15, 1922.

DEATH, SUDDEN, IN TWO PATIENTS FOLLOWING INTRAVENOUS INJECTIONS OF ACACIA. R. V. A. Lee, San Francisco. Journal American Medical Association, August 26, 1922.

DEATHS—MORBIDITY AND MORTALITY IN OBSTETRICS AS INFLUENCED BY ANESTHESIA. W. Bourne and J. W. Duncan, Montreal. Current Researches in Anesthesia and Analgesia, August, 1922.

ELECTROCARDIOGRAPHIC STUDY OF 50 PATIENTS DURING OPERATIONS. W. G. Lennox, R. C. Graves and S. A. Levine, Boston. Archives of Internal Medicine, July, 1922.

ETHER ANESTHESIA ALONE OR PRECEDED BY MORPHIN, EFFECTS OF ON ALKALI METABOLISM OF DOG. R. L. Stehle, W. Bourne and H. G. Barbour, Montreal. Journal of Biological Chemistry, August, 1922.

ETHER ANESTHESIA, EFFECTS OF ON ACID BASE BALANCE OF BLOOD. J. H. Austin and G. E. Cullen, Philadelphia. Journal of Biological Chemistry, August, 1922.

ETHER, THE ANESTHETIC PROPERTIES OF PURE. R. L. Stehle and Wesley Bourne, Montreal. Journal American Medical Association, July 29, 1922.

ETHER, COTTON PROCESS, EXPERIMENTAL AND CLINICAL OBSERVATIONS ON. Paul Cassidy, Cincinnati. Current Researches in Anesthesia and Analgesia, August, 1922.

ETHER ANESTHESIA, EFFECT OF ON AFFERENT PATHS IN DECEREBRATE ANIMALS. A. Forbes and R. H. Miller, Boston. American Journal of Physiology, September, 1922.

ETHER, EFFECT OF ON PYOGENIC ORGANISMS. E. Philipp, Müenchener medizinsiche Wochenschrift, July 28, 1922.

ETHER INSUFFLATION, INTRATRACHEAL. Wm. G. Hepburn, Montreal. Current Researches in Anesthesia and Analgesia, October, 1922.

ETHERIZATION, METHODS OF. A. H. Miller, Providence, R. I. Current Researches in Anesthesia and Analgesia, August, 1922.

ETHYL CHLORID ANESTHESIA IN MINOR OPERATIONS, PRELIMINARY REPORT ON. Louise A. Oldenbourg, Berkeley, California State Journal of Medicine, November, 1922.

FEAR, ELIMINATION FROM SURGICAL PATIENT'S MIND. D. Guthrie, Sayre, Pa. Canadian Medical Association Journal, August, 1922.

HEART BLOCK, NOTE ON THE USE OF EPINEPHRIN IN. H. M. Corns and C. D. Christie. Cleveland. Journal American Medical Association, November 4, 1922.

HEMOGLOBIN, STANDARD, THE NORMAL. R. L. Haden, Kansas City, Kan. Journal American Medical Association, October 28, 1922.

HYPERTENSION, RELATION OF TO FIBROID UTERUS. J. O. Polak, Brooklyn. American Journal of Obstetric and Gynecology, September, 1922.

HYPNOSIS IN OBSTETRICS AND GYNECOLOGY. E. Siemerling. Zentralblatt für Gynäkologie, May 27, 1922.

HYPNOSIS, 50 BIRTHS UNDER. H. Heberer. Zentralblatt für Gynäkologie, May, 13, 1922.

INSUFFLATION PHARYNGEAL ANESTHESIA. A. H. Miller, M.D., Providence, R. I. Journal American Medical Association, August 5, 1922.

INTRACARDIAC SURGERY—A NEW METHOD. D. S. Allen and E. A. Graham, St. Louis. Journal American Medical Association, September 23, 1922.

LOCAL ANESTHESIA IN ABDOMINAL SURGERY, SOME ADVANTAGES OF. L. E. Likes, Lamar. Colorado Medicine, August, 1922.

LOCAL ANESTHESIA—AFTER PAIN FOLLOWING THE USE OF CONDUCTIVE ANESTHESIA. R. H. Fouser, Salem, S. D. Current Researches in Anesthesia and Analgesia, October, 1922.

LOCAL ANESTHESIA—ALCOHOL INJECTION IN FACIAL NEURALGIA. W. Harris. Lancet, July 15, 1922.

LOCAL ANESTHESIA—PERIARTERIAL INJECTION OF ALCOHOL IN THE TREATMENT OF SENILE GANGRENE. W. S. Handley. Lancet, July 22, 1922.

LOCAL ANESTHESIA—APOTHESIN. W. M. Folks, Waycross. Journal of the Medical Association of Georgia, November, 1922.

LOCAL ANESTHESIA, ARTERIAL. B. N. Calcagno. Semana Medica, April 27, 1922.

LOCAL AND BLOCK ANESTHESIA. H. O. Howitt. Canadian Medical Association Journal, August, 1922.

LOCAL ANESTHESIA—EXPERIENCES WITH BRACHIAL PLEXUS ANESTHESIA. Eivind Platou. Norsk Magazin for Laegevidenskaben, September, 1922.

LOCAL ANESTHESIA—BUTYN, A NEW LOCAL ANESTHETIC. A. E. Bulson, Fort Wayne, Ind. Current Researches in Anesthesia and Analgesia, August, 1922.

LOCAL ANESTHESIA—CALCIUM AS AN EXPERIMENTAL ANTIDOTE FOR COCAIN POISONING. K. Mayer. Schweizerische medizinische Wochenschrift, August 24, 1922.

LOCAL ANESTHESIA—CESAREAN SECTION UNDER LOCAL ANESTHESIA IN PUERPERAL ECLAMPSIA. J. A. Hendrick, Shreveport, La. New Orleans Medical and Surgical Journal, August, 1922.

LOCAL ANESTHETIC, CIRCUMCISION UNDER. R. Roper. Lancet, August 12, 1922.

LOCAL ANESTHESIA—ACTION OF COCAIN ON SMOOTH MUSCLE ORGANS. A. Nagamachi. Acta Scholae Medicinalis Univ. Kioto, January 25, 1922.

LOCAL ANESTHESIA—LOCALIZATION OF CUTANEOUS NERVES BY ELECTRICAL STIMULATION FOR NERVE BLOCK ANESTHESIA. W. Hughson, Baltimore. Johns Hopkins Bulletin, September, 1922.

LOCAL ANESTHESIA—COCAIN HISTORY AND CLINICAL IMPORT. P. Wolfer. Schweizerische medizinische Wochenschrift, July 6, 1922.

LOCAL ANESTHETICS, TEMPORARY DISTURBANCES DUE TO. E. L. Ross, Chicago. Journal of Laboratory and Clinical Medicine, October, 1922.

LOCAL ANESTHESIA—ANESTHESIA OF THE MIDDLE SUPERIOR DENTAL NERVE. Leo Stern, New York City. Journal Dental Research, December, 1921.

LOCAL ANESTHESIA IN GALL-BLADDER SURGERY. Caryl Potter, St. Joseph, Mo. The Medical Herald, August, 1922.

LOCAL ANESTHESIA—INTRANASAL INJECTIONS OF ALCOHOL IN THE TREATMENT OF HYPERESTHETIC RHINITIS AND SOME OF THE NASAL NEUROSES. Otto J. Stein, Chicago. Illinois Medical Journal, July, 1922.

LOCAL ANESTHESIA, KIDNEY SURGERY UNDER. C. W. Allen, New Orleans. Current Researches in Anesthesia and Analgesia, October, 1922.

LOCAL ANESTHESIA IN REDUCTION OF LUXATIONS. L. Masse and C. Lasserre. Journal de Medicine de Bordaux, September 25, 1922.

LOCAL ANESTHESIA—BLOCKING THE SUPERIOR MAXILLARY NERVE AND ITS BRANCHES. Mendel Nevin, Brooklyn. Dental Items of Interest, October, 1922.

LOCAL ANESTHESIA, OBSERVATIONS ON 600 OPERATIONS PERFORMED UNDER. T. Schats. Munchener medizinische Wochenschrift, June 9, 1922.

LOCAL ANESTHESIA—CONTROL OF REFLEX PAINS THROUGH MECKEL'S GANGLION. G. Sluder, St. Louis and L. W. Dean, Iowa City. Southern Medical Journal, October, 1922.

LOCAL ANESTHESIA—ACCIDENTS IN CERVICAL PARAVERTEBRAL ANESTHESIA. O. Winterstein. Munchener medizinische Wochenschrift, June 23, 1922.

LOCAL ANESTHESIA—PARAVERTEBRAL ANESTHESIA IN ABDOMINAL SURGERY. N. H. Lowry, Chicago. Illinois Medical Journal, 1922.

LOCAL ANESTHESIA—PTERYGO MANDIBULAR ANESTHESIA. Mendel Nevin, Brooklyn. Dental Items of Interest, November and December, 1922.

LOCAL ANESTHESIA—ACTION OF PROCAIN ON MUSCLE TONUS. S. DeBoer. Nederlandsch Tijdschrift v. Geneeskunde, April 22, 1922.

LOCAL ANESTHESIA—EFFECT OF PROCAIN ON THE TONE OF SKELETAL MUSCLE. S. DeBoer. Deutsche medizinische Wochenschrift, June 23, 1922.

LOCAL ANESTHESIA — PROCAIN INJURY. A. Decker, Deutsche medizinische Wochenschrift, June 16, 1922.

LOCAL ANESTHESIA—RETROBULAR INJECTION OF PROCAIN-EPINEPHRIN. C. Fromaget. Journal de Medicine de Bordeaux, July 25, 1922.

LOCAL AND SACRAL ANESTHESIA IN ANO-RECTAL DISEASES. L. J. Hirschman, Detroit, Mich. Northwest Medicine, September, 1922.

LOCAL ANESTHESIA—EPIDURAL INJECTIONS IN SCIATICA. W. O. Ott, Rochester, Minn. Annals of Surgery, August, 1922.

LOCAL ANESTHESIA IN GENERAL SURGERY. A. I. McKinnon, Lincoln, Nebraska. State Medical Journal, August, 1922.

LOCAL ANESTHESIA IN GENERAL SURGERY. W. P. Fite, Muskogee. Oklahoma State Medical Association Journal, September, 1922.

LOCAL ANESTHESIA, RESECTION OF STOMACH UNDER. O. Orth. Deutsche Zeitschrift für Chirurgie, August, 1922.

LOCAL ANESTHESIA—SACRAL ANESTHESIA. G. G. Ravenel, Charleston. South Carolina Medical Association Journal, July, 1922.

LOCAL ANESTHESIA—SACRAL ANESTHESIA IN PERINEAL PROSTATECTOMY. A. J. Cowell and R. Thompson, Charlotte, N. C. Journal of Urology, July, 1922.

LOCAL ANESTHESIA—SURGERY OF SCROTUM AND ITS CONTENTS UNDER REGIONAL ANESTHESIA. W. R. Meeker, Rochester, Minn. Journal of Urology, July, 1922.

LOCAL ANESTHESIA—ASEPTIC MENINGITIS AFTER INTRASPINAL ANESTHESIA. P. Wertheimer. Lyon Chirurgical, July-August, 1922.

LOCAL ANETHESIA—INTRASPINAL ANESTHESIA. Abadie and Montero. Presse Medicale, September 13, 1922.

LOCAL ANESTHESIA—INTRASPINAL ANESTHESIA. G. C. Palacios. Semana Medica, August 17, 1922.

LOCAL ANESTHESIA—DANGERS OF INTRASPINAL ANESTHESIA. S. Wideroe and S. Dahlstrom. Acta Chirurgica Scandinavica, July 15, 1922.

LOCAL ANESTHESIA—LUMBAR SPINAL ANESTHESIA AS A METHOD OF PAINLESS CHILDBIRTH. T. Hosaka, Tokyo. Japan Medical World, August, 1922.

LOCAL ANESTHESIA—SPINAL ANESTHESIA. D. N. Kalyanvale. Edinburgh Medical Journal, July, 1022

LOCAL ANESTHESIA—SPINAL ANESTHESIA. J. R. Garner, Atlanta, Ga. Southern Medical Journal, August, 1922.

LOCAL ANESTHESIA—SPINAL ANESTHESIA, STOVAIN. I. di Pace. Riforma Medica, May 22, 1922.

LOCAL ANESTHESIA—IMPROVED TECHNIC FOR SPINAL ANESTHESIA. I. di Pace. Policlinico, August 28, 1922.

LOCAL ANESTHESIA—SPINAL ANESTHESIA IN PROSTATECTOMY. A. L. Chute, Boston. Journal American Medical Association, November 11, 1922.

LOCAL ANESTHESIA—REPEATED SPINAL ANESTHESIA IN THE SAME SUBJECT. I. di Pace, Policlinico, June 15, 1922.

LOCAL ANESTHESIA—BLOCKING THE SPLANCHNIC NERVES. A Gutierrez. Semana Medica, July 6, 1922.

LOCAL ANESTHESIA—SPLANCHNIC ANESTHESIA FOR TALMA'S OPERATION FOR CIRRHOSIS OF THE LIVER. M. Casper, Louisville. Kentucky Medical Journal, August, 1922.

LOCAL ANESTHESIA AS A SUPPLEMENT TO GENERAL NARCOSIS. M. N. Hadley, Indianapolis. Indiana State Medical Journal, August, 1922.

LOCAL ANESTHESIA—THE SURGICAL MANAGEMENT OF SERIOUS FOCAL INFECTION CASES. T. A. Hardgrove, Fond du Lac, Wis. Dental Summary, September, 1922.

LOCAL ANESTHESIA, A SYSTEM OF APPLYING. R. E. Farr, Minneapolis. Illinois Medical Journal, August, 1922.

LOCAL ANESTHESIA—PERMANENT CURE OF TRIGEMINAL NEURALGIA. W. T. Coughlin, St. Louis. Arkansas Medical Society Journal, August, 1922.

LOCAL ANESTHESIA, TONSILLECTOMY UNDER. F. A. Grafe, Cincinnati. Medical Review of Reviews, October, 1922.

LOCAL ANESTHESIA IN TONSILLECTOMY. K. L. Craft, Indianapolis Medical Journal, August, 1922.

LOCAL ANESTHESIA IN UROLOGIC SURGERY. M. Kappis. Zeitschrift für Urologische Chirurgie, July 12, 1922.

MEDICO-LEGAL—DEATH UNDER ANESTHESIA—CARE REQUIRED IN SELECTION OF HOSPITAL EMPLOYEES—SCALDING HOT INJECTION. Journal American Medical Association, November 25, 1922.

MEDICAL LEGAL—LIABILITY AS PARTNERS—ADMINISTRATION OF ANESTHETICS BY NURSE—EVIDENCE. Journal American Medical Association, September 16, 1922.

MEDICO-LEGAL—LIABILITY OF PHYSICIAN NEGLIGENTLY CUTTING TONGUE UNDER ANESTHESIA. Journal American Medical Association, October 21, 1922.

MEDICO-LEGAL—MALPRACTICE. H. T. Weston, Hartford, Conn. Dental Cosmos, October, 1922.

MEDICO-LEGAL—NOT UNREASONABLE REFUSAL TO SUBMIT TO OPERATION UNDER ANESTHESIA. Journal American Medical Association, October 7, 1922.

NEGATIVE CHAMBER IN OPEN PNEUMOTHORAX. W. Meyer, New York City. Archives of Surgery, July, 1922.

NITROUS OXID-OXYGEN ANESTHESIA FOR DENTISTRY AND ITS STANDARDIZED INDUCTION. J. A. Heidbrink, Minneapolis. Dental Summary, August, 1922.

NITROUS OXID-OXYGEN ANESTHESIA, ETHER ADDITION IN. H. H. Powers, Bay City, Mich. Dental Cosmos, August, 1922.

NITROUS OXID-OXYGEN ANESTHESIA IN MAJOR SURGERY. A. W. Blain, Detroit. Michigan State Medical Society Journal, November, 1922.

NITROUS OXID, THE FAULTINESS OF RAPID INDUCTION OF ANESTHESIA WITH. A. E. Guedel, Indianapolis. Current Researches in Anesthesia and Analgesia, October, 1922.

NITROUS OXID-OXYGEN ANALGESIA IN COMBINATION WITH LOCAL ANESTHESIA IN CESARIAN SECTION. W. F. Hewitt, Chicago. Current Researches in Anesthesia and Analgesia, August, 1922.

NITROUS OXID IN OBSTETRICS, REMARKS ON THE TECHNIC OF. A. E. Guedel, Indianapolis. American Journal of Surgery, Anesthesia Supplement, October, 1922.

NITROUS OXID-OXYGEN ANALGESIA AND ANESTHESIA, CONTINUOUS WITH REBREATHING IN OBSTETRICS. A. E. Rives, East St. Louis, Ill. Current Researches in Anesthesia and Analgesia, August, 1922.

NITROUS OXID-OXYGEN ANESTHESIA, PRELIMINARY REPORT OF AN INVESTIGATION INTO THE OXYGEN PERCENTAGES OF. Dorothy A. Wood and Mary E. Botsford, San Francisco. Dental Summary, August, 1922.

NITROUS OXID-OXYGEN ANESTHESIA, PROLONGED. TECHNIC OF ADMINISTRATION AND CASE REPORTS. Edgar W. Smith, Kansas City, Mo. Dental Summary, September, 1922.

NITROUS OXID-OXYGEN ANESTHESIA, ELEVEN YEARS OBSERVATION OF THE MINUTE VOLUME OF RESPIRATION IN, WITH A DISCUSSION OF SOME FACTORS AFFECTING SAME. E. I. McKesson, Toledo. Current Researches in Anesthesia and Analgesia, October, 1922.

NITROUS OXID AS AN ANESTHETIC, TEN YEARS EXPERIENCE WITH. P. J. Flagg. New York State Journal of Medicine, September, 1922.

OXIDS OF NITROGEN, A CONTRIBUTION TO THE STUDY OF THE THERAPEUTIC VALUE OF. W. H. MORSE, Hartford, Conn. American Medicine, September, 1922.

OXYGEN, THE THERAPEUTIC USE OF. Alvan L. Barach, New York City. Journal Americal Medical Association, August 26, 1922.

PREOPERATIVE ANESTHESIA, COMPLICATIONS, PHYSICAL EXAMINATION AND MANAGEMENT OF. F. A. Thompson, Milwaukee, Wis. Journal American Dental Association, August, 1922.

PREOPERATIVE COMPLICATIONS OF ANESTHESIA—CARDIO-VASCULAR RENAL DISEASE. G. H. Lathrop, Newark, N. J. Dental Cosmos, August, 1922.

PREOPERATIVE COMPLICATIONS—TWO CASES OF EPILEPTIFORM CONVULSIONS DURING ANESTHESIA. H. H. L. Patch, London. Lancet, October 14, 1922.

PREOPERATIVE COMPLICATIONS—SOME OBSERVATIONS OF THE VALUE OF PREOPERATIVE TREATMENT FOR THE SURGICAL PATIENT IN RELATION TO ANESTHESIA. W. J. DeFries, Toronto. Current Researches in Anesthesia and Analgesia, October, 1922.

PREOPERATIVE COMPLICATIONS—THE DESPERATE RISK GOITER. M. B. Tinker, Ithaca, N. Y. Journal American Medical Association, October 14, 1922.

PREOPERATIVE COMPLICATIONS — INDICATIONS FOR AND AGAINST OPERATION IN THE TREATMENT OF HEAD INJURIES. W. Sharpe, New York. American Journal of Surgery, November, 1922.

PREOPERATIVE DIGITALIZATION: A METHOD TO REDUCE POSTOPERATIVE COMPLICATIONS. S. H. Geist and J. S. Somberg, New York City. American Journal of Obstetrics and Gynecology, September, 1922.

PREOPERATIVE AND POSTOPERATIVE CARE, IMPROVEMENTS IN. F. B. Taylor, W. I. Terry and W. C. Alvarez, San Francisco. Journal American Medical Association, November 4, 1922.

POISONING—TREATMENT OF CARBON MONOXID ASPHYXIA BY MEANS OF OXYGEN AND CARBON DIOXID INHALATION. Yandell Henderson and H. W. Haggard, New Haven, Conn. Journal Americal Medical Association, September 30, 1922.

POSTOPERATIVE COMPLICATIONS—POSTEXTRACTION PAIN, SOME ETIOLOGICAL FACTORS AND TREATMENT OF. Maurice Smith, Los Angeles. Australian Journal of Dentistry, July 1, 1922.

POSTOPERATIVE COMPLICATIONS—POSTEXTRACTION PAIN. Hector Polk, New York City. Dental Digest, August, 1922.

POSTOPERATIVE COMPLICATIONS — GLUCOSE SOLUTION IN POSTOPERATIVE THYROID ACIDOSIS. E. Goetsch and E. J. Browder, Brooklyn. New York State Journal of Medicine, October, 1922.

POSTOPERATIVE ABDOMINAL CASES, MEDICAL CARE OF. R. D. Rudolf, Toronto. Canadian Medical Association Journal, July, 1922.

POSTOPERATIVE MASSIVE COLLAPSE OF THE LUNGS. H. Elwin and J. Girsdansky, New York City. Journal American Medical Association, August 26, 1922.

POSTOPERATIVE COMPLICATIONS—PULMONARY ABSCESS FOLLOWING NOSE THROAT SURGERY, RELATION OF ANESTHETIC TO. Cline N. Chipman, Washington. Journal American Medical Association, August 12, 1922.

POSTOPERATIVE COMPLICATIONS OF THE RESPIRATORY TRACT. H. R. Decker, Pittsburgh. Canadian Medical Association, August 12, 1922.

POSTOPERATIVE COMPLICATIONS—ACUTE DILATATION OF THE STOMACH. L. R. and Carl A. Dragstedt, Chciago. Journal American Medical Association, August 19, 1922.

POSTOPERATIVE COMPLICATIONS—ANESTHESIA IN RELATION TO POSTOPERATIVE EXACERBATION OF THE SYMPTOMS OF SYETEMATIC INFECTION. R. H. Harms, Omaha. Dental Items of Interest, October, 1922.

PRESIDENT'S ADDRESS—SECOND ANNUAL MEETING OF THE CANADIAN SOCIETY OF ANESTHETISTS. William Webster, Winnipeg. Current Researches in Anesthesia and Analgesia, October, 1922.

RESUSCITATION—VALUE OF ARTIFICIAL AIDS TO RESPIRATION IN ACUTE OPERATIVE COLLAPSE OF THE LUNGS OCCURRING DURING INTRATHORACIC OPERATIONS. R. Matas, New Orleans. Archives of Surgery, July, 1922.

RESPIRATION, CHEMICAL CONTROL OF. J. J. R. Macleod, Toronto. Pennsylvania Medical Journal, September, 1922.

RESPIRATION IN EXOPHTHALMIC GOITER. P. Sainton and E. Schulman. Annales de Medicine, September, 1922.

RESUSCITATION — COMPARATIVE STUDY OF DIFFERENT METHODS OF ARTIFICIAL RESPIRATION. R. Burton-Opitz, New York. American Journal of Physiology, August, 1922.

RESUSCITATION BY THE INTRACARDIAC INJECTION OF EPINEPHRIN. J. Gottesman, New York. Journal American Medical Association, October 14, 1922.

SCOPOLAMIN IN CRIMINOLOGY. E. House, Ferris. Texas Medical Journal, September, 1922.

SCOPOLAMIN MORPHIN IN LABOR. W. O. Greenwood and N. Hirschmann. British Medical Journal, October 14, 1922.

SHOCK, RECENT EVIDENCE AS TO THE NATURE OF WOUND. W. B. Cannon, Boston. Northwest Medicine, September, 1922.

TRACHEAL INSUFFLATION, AN IMPROVED TECHNIC FOR DIRECT OR EXTERNAL: REPORT OF ADMINISTRATIONS. W. Hamilton Long, Louisville. Kentucky Medical Journal, October, 1922.

TWILIGHT SLEEP BIRTHS, REPORT ON 65. M. Werner. Munchener medizinische Wochenschrift, July 14, 1922.

TWILIGHT SLEEP, REVISED METHOD OF. E. House, Ferris, Texas. Practical Medicine and Surgery, August, 1922.

American Journal of Surgery

QUARTERLY SUPPLEMENT of ANESTHESIA & ANALGESIA

(American Journal of Anesthesia and Analgesia)

Printing Papers from the Transactions of the

Interstate Association of Anesthetists
American Association of Anesthetists
Canadian Society of Anesthetists
Scottish Society of Anesthetists
Mid-Western Association of Anesthetists
Pacific Coast Association of Anesthetists
National Anesthesia Research Society
New York Society of Anesthetists
Royal Society of Medicine, Anesthetic Section
Boston, Providence, Toledo, Louisville, Indianapolis, Chicago, Kansas City, Colorado, Seattle, Northern and Southern California Societies of Anesthetists

F. H. McMECHAN, M.A., M.D., Editor

Associate Editors

JAMES TAYLOE GWATHMEY, M.D.
DUDLEY W. BUXTON, M.D., M.R.C.P.
WILLIS D. GATCH, M.D., F.A.C.S.
JOHN D. MORTIMER, M.D., F.R.C.S.
PROF. C. BASKERVILLE, Ph.D., F.C.S.
ARTHUR E. HERTZLER, M.D., F.A.C.S.
WM. HARPER DEFORD, D.D.S., M.D.
ISABELLA C. HERB, A.B., M.D.
G. A. H. BARTON, A.B., M.D.
SAMUEL JOHNSTON, M.A., M.D.
FRANCIS E. SHIPWAY, M.A., M.D.
CHARLES K. TETER, D.D.S.
CARROLL W. ALLEN, M.D., F.A.C.S.
EDWARD H. EMBLEY, M.D., B.Ch.
TORRANCE THOMPSON, M.D.
PROF. YANDELL HENDERSON, Ph.D.
E. I. McKESSON, A.B., M.D.
ARTHUR E. SMITH, M.D., D.D.S.
J. F. W. SILK, M.D., O.B.E.
H. E. G. BOYLE, O.B.E., M.R.C.S.

April — *CONTENTS OF THIS ISSUE* — *1923*

SOME UNUSUAL COMPLICATIONS OF NITROUS OXID-OXYGEN ANESTHESIA	Ansel M. Caine, New Orleans, La.	34
BLOOD PRESSURE DURING SURGICAL OPERATIONS UNDER GENERAL ANESTHETICS	Morris H. Clark, Kansas City, Mo.	37
CIRCULATORY CHANGES DURING ANESTHESIA	John R. Worley, Dallas, Texas	40
THE PHYSIOLOGICAL EFFECTS OF NITROUS OXID	Neil C. Trew, Los Angeles, Calif.	41
INTRATRACHEAL INSUFFLATION ANESTHESIA	Mary Kavanagh, San Francisco, Calif.	44
ANESTHESIA AS A PART TIME SPECIALTY	Moses Salzer, Cincinnati, O.	48
THE ANESTHESTIST ON THE HOSPITAL STAFF	Chas. H. Sanford, New York City	50
OXYGEN IN THE PERITONEAL CAVITY: WITH CASE REPORTS	Wm. S. Bainbridge, New York City	52
GENERAL ANESTHESIA IN SUBMUCOUS AND OTHER NASAL OPERATIONS	J. G. Poe, Dallas, Texas	56

DEPARTMENTS

EDITORIALS - - - - - - - 58

SOCIETY PROCEEDINGS - - - 58 QUARTERLY INDEX - - - - - 62

SOME UNUSUAL COMPLICATIONS OF NITROUS OXID-OXYGEN ANESTHESIA.*

ANSEL M. CAINE, M.D.,
NEW ORLEANS, LA.

While there is nothing cheering, either to the reporter or to those who hear, connected with the reporting of these cases, yet there might be something edifying to a body, whose members devote their lives to better anesthesia. It is the silver lining to a black cloud when the misfortunes of one sound a warning to another, especially when that warning is heeded. Those who are wise profit by the mistakes of others, while the foolish must needs duplicate them before taking heed.

Then, too, there are some questions connected with these cases not yet answered in my own mind, and some of those present may be able to answer them.

Of two of these cases I am giving complete records. Of the other two I have no records, and only report from memory. I will say that these are all of the calamities I have had during the past twelve years that I can attribute to nitrous oxid.

ILLUSTRATIVE CASE REPORTS.

Case 1.—White, female, aged 39 years, married. Weighed about 220 pounds. Came to the hospital suffering violent pains in upper abdomen in region of gall-bladder. Pain was so severe that she had ⅛ gr. of morphin the night she arrived in the hospital, 1-6 gr. the next night, and ¼ gr. before going to the operating room, which was 36 hours after arrival in the institution. *Physical examination* showed heart not enlarged and sounds normal. Blood pressures were not taken. Urine showed no albumen or casts. White count 19,250 with 85 per cent P. N. N., and a hemoglobin reading of 75 per cent.

Preoperative diagnosis, acute cholecystitis. Operation proposed, cholecystostomy.

Operation 6/30/'21. Anesthetic used nitrous oxid-oxygen. Induction commenced at 9:26 A. M. and operation at 9:35. Incision made over gall-bladder to fascia, which, together with muscle, was then infiltrated with 0.5 per cent novocain solution and abdomen then opened. Relaxation was good, and color fair. The gall-bladder was found enormously distended and tense to almost the point of bursting, dark red in color. A trochar was inserted and bloody pus and thick mucoid material removed. It was then opened and no stones found either in bladder or ducts. Drainage tube was inserted and held in place by double line of sutures, then brought out through stab wound lower on side. Incision closed, and operation completed at 10:41. A lot took place during the last sentence, however.

The closure was going well, one small pack being left in, but when only a small opening was left at the lower end of the peritoneal wound, the pack was removed gently. This being one of the walling off packs, a portion of it was behind the gall-bladder, and, as this was withdrawn, it pulled the tube from the gall-bladder with it. This necessitated opening the peritoneum in full again in order to reinsert the tube. In order to again get good relaxation I saturated the patient. Respirations slowed down, pupils remaining contracted. I had the lid raised so that I could watch the pupils all the time I was saturating. Respirations stopped, pupils remaining contracted. I waited a little after turning the dial to pure oxygen, not believing that the respirations were permanently stopped with contracted pupils. At this point I felt the temporal pulse and found there was none. I immediately forcibly inflated the lungs with oxygen, and, at this stage, the pupils dilated. Several rythmical inflations of lungs did not restore color or heart beat, so I advised the surgeon to massage the heart through the diaphragm, which he did, reporting that there was no movement of the heart noted. After about half a minute of this, during which time the lungs were rythmically distended with oxygen, the heart responded with a beat, and was soon beating as though nothing had happened. The pupils contracted and respirations returned. There was a total stoppage of the heart's action of from a minute to a minute and a half. From this time on patient was given 50-50 of nitrous oxid and oxygen, and was profoundly relaxed. After completion of operation several minutes of respiring pure oxygen did not restore consciousness, not even a semblance of it. Patient was returned to her room, and work commenced on the next case.

About an hour and a half later I requested my partner, Dr. Allgeyer, to go down and look the patient over and take her blood pressures. He reported no return of consciousness, and blood pressures of 105/70; respiration 30 and pulse 138.

Progress sheet showed the following: 11:15. Resp. 26 and irregular; pulse 132 and good.

12:30 P. M. Resp. 30, pulse 138. Vomited 4 oz. dark brown fluid.

1:00. Resp. 30, pulse 138. Axillary temp. 102.6°.

2:30. Resp. 32, pulse 132. Patient beginning to awaken. (I called a short time after this and found no evidence of recovery.)

4:00. Resp. 34, pulse 140. Coughing at intervals. Still asleep. Axillary temp. 102.8°.

5:00. Respiration and pulse the same. I called and found patient apparently recovering. Able to swallow water and bat her eyes. Oxygen administered.

6:00. Resp. 32, pulse 132. Considerable mucus in throat, and gurgling. Throat aspirated. Coughing frequently. Ax. temp. 102.6°. Oxygen given.

8:00. I called again. Resp. 38, pulse 140, and variable. Patient able to bow her head in response when I asked question. Oxygen administered.

8:35. Digalen min. x, and strychnin, gr. 1/40 by needle.

11:00. Resp. 38, pulse 146; temp. by axilla 102.4°. Complaining of pain in lower abdomen. Mustard jacket applied to chest.

*Read during the Joint Meeting of the American and Mid-Western Assiciations of Anesthetists, Hotel Jefferson, St. Louis, May 22-24, 1922.

12:30 A. M. Resp. 44, pulse 150. Digalen and strychnin again administered.

1:00. Ounces 4 of urine drawn from bladder. Vomited green fluid. Hot water given at intervals. Respirations 44, pulse 140.

2:10. Resp. 50, pulse 152.

2:30. Resp. 56, pulse 150. Oxygen administered by interne. Hypodermoclysis started.

3:00. Resp. 50, pulse 150, and temp. 104° by axilla.

3:30. Patient died.

Case 2.—White, female, aged 58 years, widow. Rather fleshy. Came to hospital with diagnosis of chronic cholecystitis (probably cholelithiasis) and chronic appendicitis. Because of slight bronchitis, patient was kept in hospital 10 days until this had entirely cleared up before operation.

Physical examination showed heart's action good, although slight murmur was heard at apex. No enlargement. Blood pressure 145/90. Urine normal. Lungs normal at time of operation.

Patient was given ¼ gr. morphin and 1/150 gr. atropin just before going to operating room. Operated 10/31/'21. Anesthetic agent nitrous oxid-oxygen. Induction commenced at 2:00 P. M. and operation at 2:10. Anesthetic discontinued at 2:50 and operation at 3 P. M. Patient's respiration was not smooth, but slight grunting from start. Tried to relieve this by saturating several times, the patient's respirations slowing down very quickly each time to almost stopping point, pupils remaining small, but as soon as oxygen was added grunting would begin again. Abdomen opened in similar place and way as previous case. Stomach found normal under vision and palpation. Gall-bladder and appendix were quickly removed, and packs taken out. Owing to constant grunting and the intestines bobbing up, I saturated again, hoping to relieve this condition. Respiration quickly slowed down and stopped, pulse good and pupils contracted. Dial on apparatus was turned to 50-50, and I waited a moment for another respiration, *but only a moment.* Was just turning on emergency oxygen for forced inflation of lungs when pulse stopped and pupils dilated. *Until this time pupils remained contracted.* I quickly inflated lungs, but there was no response in color, and no return of pulse. The peritoneal closure was just completed, but I advised massage of heart, so the surgeon, Dr. Russell E. Stone, quickly opened and pressed the heart through the diaphragm. After a few strokes its action was restored, respirations, and color were restored and pupils contracted; 50-50 gas and oxygen were used to close peritoneum, but this was unnecessary, as relaxation was profound throughout the remainder of the closure, and long afterward. Pupils contracted and eyeballs fixed centrally. This state continued for 45 minutes after return to room, during which time I remained at her bedside. Her blood pressure was 100/65 on returning to room, but rose to 120/80 in a few minutes. Reflexes were restored after 45 minutes. Three hours later was able to respond to questions in a hazy way. Able to talk intelligently six hours after operation, and was apparently normal next morning, except she said that she saw white balls before her eyes. Vomited quite a good deal during the night, and voided 20 ounces of urine. Restless next day after operation, but this was relieved to some extent with ½ gr. codein.

During first 24 hours there was much more nausea than usual. On the morning of the second day there was no more complaint from spots before her eyes, and everything seemed all right. This continued for about three days, when she complained of pain in back of her neck. I dropped in to see her and she said she could not distinguish my features, said she could only see me in outline. Eyes looked perfectly normal. After another day or two she said she was paralyzed on her left side. This was not really so, for when her mind was distracted she could move that side very well, and had a good grip in her left hand. She insisted that she was paralyzed on that side, however. The pain in her neck extended to her back and shoulders, and she moaned a great deal. The pain seemed to leave her then, but she continued to moan. Appetite was good. Her recovery from the operative work was rapid and uneventful, and, since her trouble seemed to be other than surgical, Dr. Stone requested an oculist to see her and examine her eyes. He found nothing wrong at all with the eyes themselves. A neurologist was then called in who went over her thoroughly and carefully. He frankly said he did not know what the pathology was, but was of the opinion that she was a very sick woman. He talked to me about her, and I explained to him what took place on the operating table. He said there might be some edematous condition of the brain, but had no fixed opinion as to her pathology. Her daughter, who was a trained nurse, said her mother was very much spoiled and petted, seemed to think that some of it was unreal, especially since she could use her arm when she said she could not. The neurologist insisted that she was very sick, however. Eyes looked very droopy. After three weeks she was gotten out of bed and walked a little. She took no interest in any thing. Thinking a change of scene would possibly do good, it was decided to take her home, but against the advice of the neurologist.

At home there was no improvement, although her appetite was excellent. She had ordered a car before going to the hospital and was enthusiastic over the prospect of its arrival. The car had come while she was away, but when shown it she manifested no interest at all. Her chickens could not excite her interest any more. She continued to get worse rather than better, and the folks decided to bring her back to the city, but this time to another hospital and to other physicians. Several saw her and stated they could do her no good, but that she was going to die very soon, which she did December 31, just two months after the operation. (I did not see her this time, and learned this from her daughter.)

Cases 3 *and* 4 were mentioned and discussed before the New Orleans meeting two years ago, so I am only bringing them up to make the list complete.

Case 3.—Mulatto, female, hairdresser, aged 37

years, married. Very intelligent. Weighed at time of operation 206 pounds. Physically in good condition. Operated for fibroid uterus by Dr. Matas, 1/23/'13. Nitrous oxid-oxygen used. Equipment rather poor, although as good as to be had at that time. Induction rather easy as well as I can remember. A little ether added for relaxation. Was running along fairly well. Pelvis was deep and there were adhesions, so the operation was difficult. Since there was no regulator on cylinders and small cylinders were being used, the flow of gas was irregular, and percentage of oxygen irregular. The color of the patient made it a little difficult to note cyanosis, so too low a percentage was used, and patient stopped breathing. Finger on pulse showed that heart had also stopped, so lungs were inflated with oxygen. No response. Heart was massaged through diaphragm, and after about two minutes its action was restored. There was no return of respiratory function at that time, so artificial respiration was kept up with oxygen for 5 minutes longer before there was return of normal action. Very little gas was given from that time on, and operation was completed. I do not remember how long before recovery, but there was complete paralysis after recovery, a few hours later. Surgical recovery was normal, but patient was blind and paralyzed. The tongue was also involved, and patient was unable to extend it even to the teeth. Her blindness continued for 6 years, and she was unable to speak for 3 years so that she could be understood. She has some involuntary motion of her hands and arms now, and can distinguish colors and objects, but not features, Seems unable to rotate eyes downward, although they move from side to side at will. Seems absolutely intelligent now, but speech is unintelligible save to the initiated who understand her without any trouble. She has lost considerable in weight, but is still in pretty good condition. Teeth still almost perfect, and she has aged practically none, though she will be 47 her next birthday. Her husband, who is devoted to her, says she has improved a great deal the past three years, but she still has 4/5 of the way to go to be normal, it seems to me.

Case 4.—White, female, married, about 43 years of age. Operated for appendicitis about seven years ago. Same apparatus as in previous case. No local used. Right rectus incision, and appendix removed. A little ether added to relax. Running low percentage of oxygen, and respiration became slow and shallow. Switched off gas and turned on oxygen just as she took her last breath. Her heart stopped at this time. Lungs inflated with oxygen several times with no result, so the surgeon was asked to massage heart, which he did through diaphragm. He said as soon as he could feel it that it was relaxed, with no sign of life. He continued to massage heart for several minutes, during which time I inflated the lungs rythmically with oxygen. I kept this up for twenty minutes, but without result. Pupils did not dilate for several seconds after there was no sign of heart beat. Under the forced inflation of lungs, the color returned a little to lips, and I thought she was coming around, but the heart never responded.

CONCLUSIONS.

1. If the heart stops because of over dose of nitrous oxid, and under dose of oxygen, and remains inactive for a minute in the human being, the chances of recovery to normal are not good.

2. Restoration of heart's action and respiration does not mean that the patient is all right, but there are likely to be degenerative changes in the brain that are irreparable.

3. Restoration of consciousness and apparent normality after the heart has stopped under these circumstances, does not mean that there is no permanent damage to the brain that will be manifested later.

4. The human brain can not stand the suspension of circulation and return to normal as can the brain of the dog.

5. The pupils are not a safe guide to saturation, as there are too many exceptions to the rule of dilatation, and these exceptions, when the pupils are depended upon, are too important.

6. The respiration is a much safer guide than the pupil. When respirations slow to almost stopping point, even if deep, it is time to add more oxygen if one is saturating. When the eyeballs turn inward and become fixed, saturation is complete or almost so, independent of the pupil, and oxygen should be added at once. If respirations stop during saturation, without any delay at all inflate lungs with oxygen, or with a high percentage of gas and oxygen (25 to 50 per cent oxygen).

7. Nitrous oxid and oxygen anesthesia is safe as long as sufficient oxygen is given, but when the oxygen is discontinued for the purpose of saturation in order to secure relaxation, the greatest attention is demanded and the respiration should never be allowed to fail.

1640 ROBERT ST.

THE AMERICAN AND PACIFIC COAST ANESTHETISTS AND THE SECTION ON ANESTHESIOLOGY OF THE CALIFORNIA STATE MEDICAL SOCIETY, WILL MEET AT THE HOTEL STEWART, SAN FRANCISCO, JULY 22-26 DURING CALIFORNIA STATE AND A. M. A. WEEK. MAKE YOUR PLANS NOW TO ATTEND AND ENJOY AN EXCEPTIONAL OPPORTUNITY NOT ONLY FOR ATTENDING A SPLENDID SCIENTIFIC MEETING, BUT ALSO OF TAKING A WONDERFUL SIGHT-SEEING TOUR. ALL THE TRANSCONTINENTAL LINES ARE RUNNING SPECIAL TRAINS AND TRIPS SO THAT YOU CAN MAKE ANY ARRANGEMENTS THAT APPEAL TO YOU.

BLOOD PRESSURE DURING SURGICAL OPERATIONS UNDER GENERAL ANESTHETICS.*

MORRIS H. CLARK, M.D.,
KANSAS CITY, MO.

Mechanically, blood pressure is dependent upon three factors for its maintenance: (1) the motor force. (2) The resistance of the containing vessels. (3) The amount of fluid present.

Physiologically, it is dependent upon the nervous control governing the various units of the vasomotor system, which, in turn, are to a great extent dependent upon the character of the contents of the blood stream.

Thus it is evident that anything disturbing the minute physics or chemistry of the delicately human organism, will more or less be reflected in the blood pressure. It is little wonder then that we see in surgical operations under general anesthesia such sudden and marked changes in the cardiovascular system.

CLASSIFICATION OF CHANGES.

Changes during operation may be divided into two classes: (a) Those due to the anesthetic, and (b) those due to the operative procedure. From a clinical standpoint, during operation it is frequently difficult to differentiate these causes.

Anesthesia: We know, however, that *any anesthetic produces chemical changes in the blood stream acting directly upon the nervous centers, causing at first, a stimulation and later a depression, which varies in degree in proportion to the depth of anesthesia and the time of administration.*

There is a marked difference in the various anesthetic agents more commonly used. *Chloroform* produces slight stimulation during induction and marked depression later. *Ether* produces marked stimulation during induction and a more gradual onset of the depression period. *Nitrous oxid,* which is of less toxicity, entering less in chemical combination and escaping more quickly from the blood stream, also produces less change in the blood pressure than ether or chlorofrom.

Another factor which may be mentioned in this connection, is the pressure raising property of carbon dioxid. Tong (AMERICAN JOURNAL OF SURGERY, Anesthesia Supplement, July, 1922), has shown that by rebreathing, pressure may be made raised from 10 to 40 mm.

Surgery: From the surgical side, the factors entering into vasomotor disturbances are many. A few of the most important are: (1) hemorrhage; (2) trauma; (3) fear; (4) posture during operation; and (5) sudden reduction of cerebral or abdominal pressure (in those cases in which it is previously abnormally high).

Hemorrhage is probably the most common, though not the most fatal offender. Sudden hemorrhage will cause a more marked disturbance than the same amount of blood slowly lost.

Trauma is next in importance and frequency. Any persistent trauma about the larger nerve trunks or in rich, nerve-bearing tissues, which lasts over thirty minutes will produce a marked shock, and fall of blood pressure.

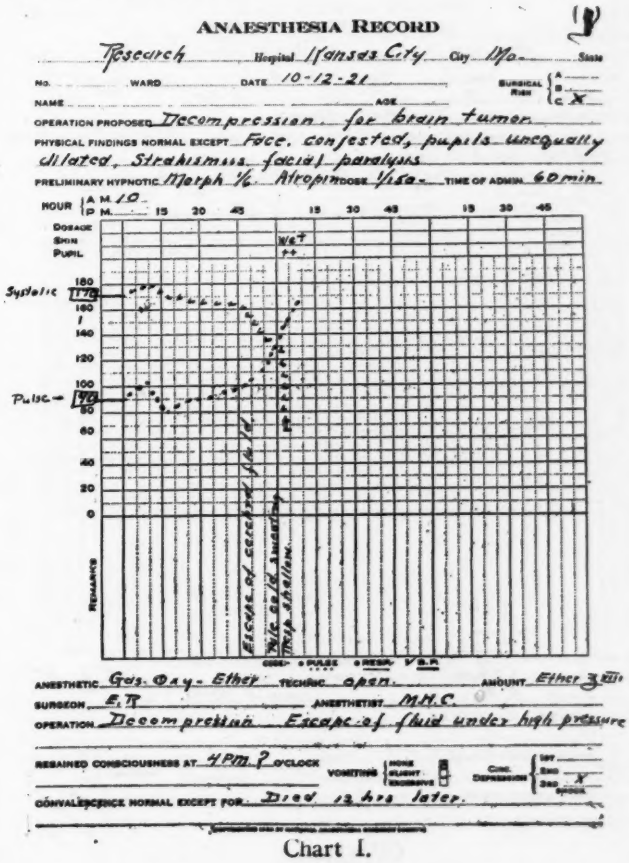


Chart 1.

CONDITION OF PATIENTS.

In discussing blood pressure and surgical operation it is also necessary to take into consideration those conditions in patients which may predispose to early blood pressure changes. The condition of the cardiac musculature is of utmost importance. It may be defective from many different causes, such as fatigue; sclerosis; effort to compensate for leaky valves; effort to maintain circulation against high blood pressure stasis, or defective nutrition from an impoverished blood stream. *No matter what the cause, when the musculature is defective, an early and serious fall in pressure may be predicted. In this connection, it might also be well to state that in the absence of other distinct, clinical symptoms of*

*Read during the Joint Meeting of the American and Mid-Western Associations of Anesthetists, Hotel Jefferson, St. Louis, Mo., May 22-24, 1922.

muscular insufficiency, a comparative, dull and indistinct first sound should be sufficient to direct suspicion toward the strength of that organ.

To be of the greatest prognostic value during operation, interpretation of blood pressure readings should be based on a thorough knowledge of the general conditions of the patient, the nature and length of the operation and action of the anesthetic agent being used.

In the accompanying charts I wish to illustrate some of the more typical cardiovascular reactions occurring in various types of patients and during certain operations:

(2)

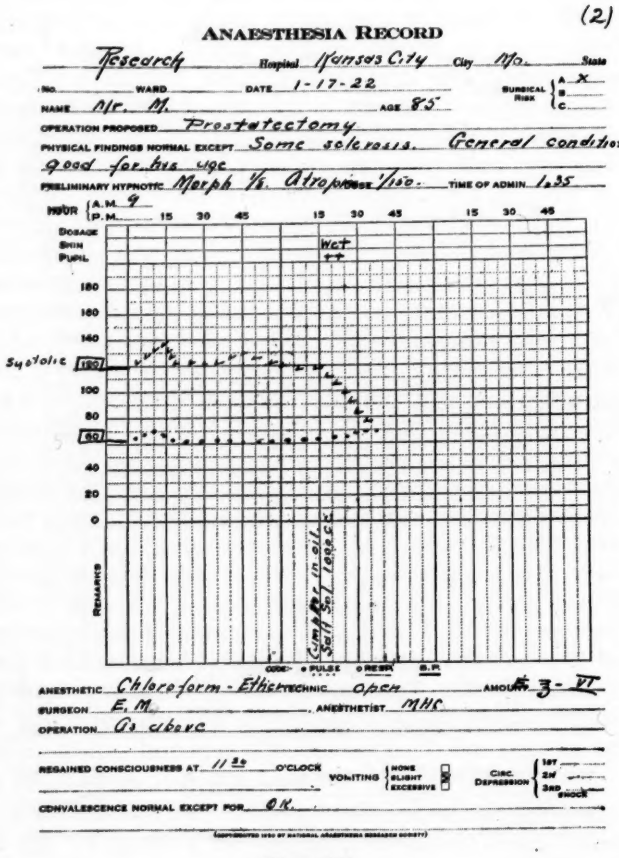

ANAESTHESIA RECORD
Research Hospital Kansas City City Mo. State
NO. WARD DATE 1-17-22 SURGICAL RISK A X B C
NAME Mr. M. AGE 85
OPERATION PROPOSED Prostatectomy
PHYSICAL FINDINGS NORMAL EXCEPT Some sclerosis. General condition good for his age
PRELIMINARY HYPNOTIC Morph ⅙ Atropine 1/150. TIME OF ADMIN. 1.35
HOUR A.M. 9 P.M. 15 30 45 15 30 45 15 30 45
DOSAGE SKIN PUPIL
Systolic 180 160 140 120 100 80 60 40 20 0
Wet ++
Simple in oil Salt Sol 1000 cc
REMARKS
CODE: ● PULSE ○ RESP. B.P.
ANESTHETIC Chloroform - Ether TECHNIC open AMOUNT 3 - VT
SURGEON E. M. ANESTHETIST MHK
OPERATION As above
REGAINED CONSCIOUSNESS AT 11 30 O'CLOCK VOMITING NONE SLIGHT EXCESSIVE X
CIRC. DEPRESSION 1ST 2ND 3RD SHOCK
CONVALESCENCE NORMAL EXCEPT FOR O.K.

Chart II.

ILLUSTRATIVE CASE REPORTS.

Case 1.—Female, aged 38 years. Face congested. Pupils dilated. Partial facial paralysis. Pulse 90. Blood pressure 173/118. Diagnosis: Brain tumor. Operation: decompression. This case illustrates the effect of sudden release of cerebral fluid under high tension. For thirty minutes there was little change. When the dura was opened, however, the fluid escaped rapidly and the pulse immediately went to 106; the blood pressure to 80/40. The patient died fifteen hours following operation (Chart I).

Case 2.—Male, aged 85 years. Good, general physical condition. Pulse 60. Blood pressures 120/60. Diagnosis: hypertrophied prostate. Operation: prostatectomy. This chart illustrates the abnormal relation between pulse and blood pressure during operation, which is very frequently seen in old people. During operation the blood pressure suddenly fell to 70, the patient became cold and clammy, yet at this time the pulse scarcely made any change in rate. After 1000 cc. of water blood pressures reacted well (Chart II).

Case 3.—Female, aged 32 years. Pale, sweating, air-hunger, restless. Pulse 135. Blood pressures 80/30. Diagnosis: ruptured ectopic pregnancy. Operation: salpingectomy. This case illustrates the value of preoperative treatment. One-sixth grain of morphine and 1000 cc. salt solution were given intravenously. In thirty minutes pulse came down to 110 and the blood pressures came to 125/60. The operation was then performed and the pulse and

(3)

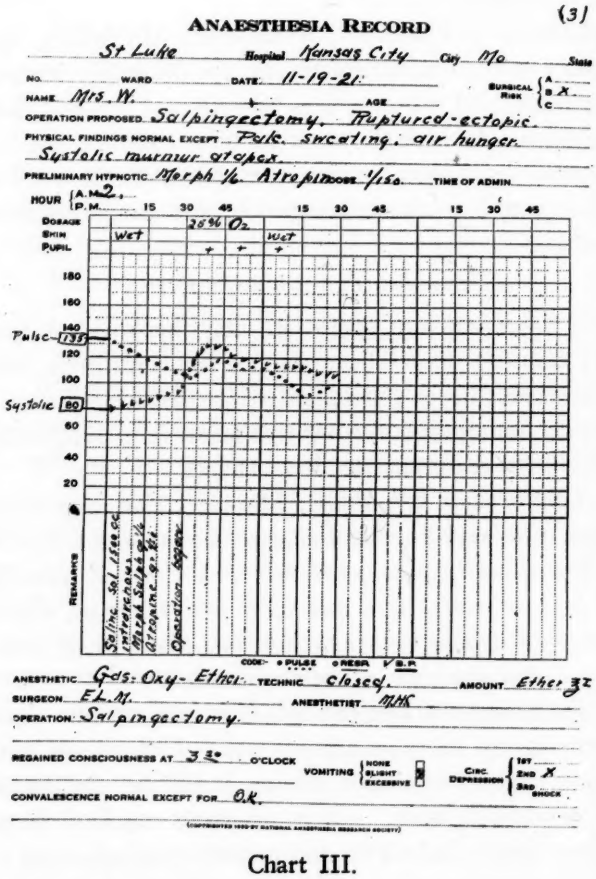

ANAESTHESIA RECORD
St Luke Hospital Kansas City City Mo State
NO. WARD DATE 11-19-21 SURGICAL RISK A B X C
NAME Mrs. W. AGE
OPERATION PROPOSED Salpingectomy. Ruptured ectopic.
PHYSICAL FINDINGS NORMAL EXCEPT Pale, sweating, air hunger. Systolic murmur at apex.
PRELIMINARY HYPNOTIC Morph ⅙ Atropine 1/150. TIME OF ADMIN.
HOUR A.M. 2 P.M. 15 30 45 15 30 45 15 30 45
DOSAGE SKIN PUPIL
Wet 25% O2 Wet
Pulse 135
Systolic 80
180 160 140 120 100 80 60 40 20
Saline Sol 1500 cc. intravenously Morph Sulph ⅙ Atropine gr. 1/150 Operation began
REMARKS
CODE: ● PULSE ○ RESP. V B.P.
ANESTHETIC Gas: Oxy - Ether TECHNIC closed AMOUNT Ether 3z
SURGEON E.L.M. ANESTHETIST MHK
OPERATION Salpingectomy
REGAINED CONSCIOUSNESS AT 3 30 O'CLOCK VOMITING NONE SLIGHT X EXCESSIVE
CIRC. DEPRESSION 1ST 2ND X 3RD SHOCK
CONVALESCENCE NORMAL EXCEPT FOR O.K.

Chart III.

blood pressure remained good. Uneventful recovery (Chart III).

Case 4.—Male, aged 55 years. Fair physical condition. Neck veins congested. Slight symptoms of respiratory obstruction. Pulse 80. Blood pressures 160/80. Diagnosis: goiter, cystic, bilateral and substernal. Operation: thyroidectomy, bilateral, partial. During operation partial expiratory obstruction occurred. Blood pressures went up to 240/120. Pulse to 75. The obstruction was suddenly relased as the gland was delivered from under the sternum and severe hemorrhage occurred. Blood pressures dropped to 80/50. Pulse to 105 (Chart IV).

Case 5.—Female, aged 40 years. Highly nervous. Toxic. Systolic murmur heard over entire precordia. Pulse 120. Blood pressures 124/63. Diagnosis:

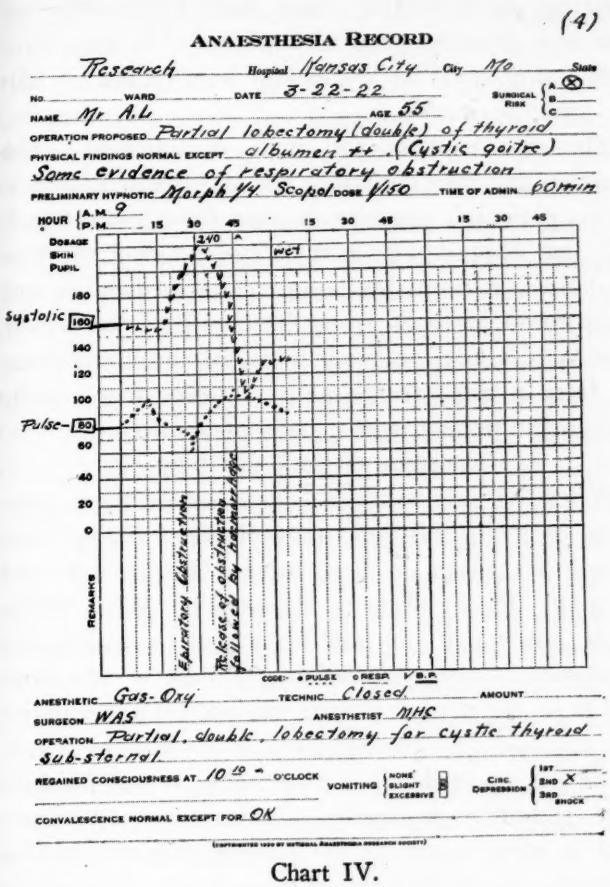

(4)
ANAESTHESIA RECORD
Research Hospital Kansas City City Mo
NAME Mr A.L AGE 55
OPERATION PROPOSED Partial lobectomy (double) of thyroid
PHYSICAL FINDINGS NORMAL EXCEPT albumen ++. (Cystic goitre)
Some evidence of respiratory obstruction
PRELIMINARY HYPNOTIC Morph 1/4 Scopol DOSE 1/150 TIME OF ADMIN. 60 min
Systolic
Pulse
ANESTHETIC Gas-Oxy TECHNIC Closed AMOUNT
SURGEON WAS ANESTHETIST MHC
OPERATION Partial, double, lobectomy for cystic thyroid
Sub-sternal
REGAINED CONSCIOUSNESS AT 10 10 m O'CLOCK
CONVALESCENCE NORMAL EXCEPT FOR OK

Chart IV.

exopthalmic goiter. Operation: thyroidectomy, bilateral, partial. In these cases of disturbance of the

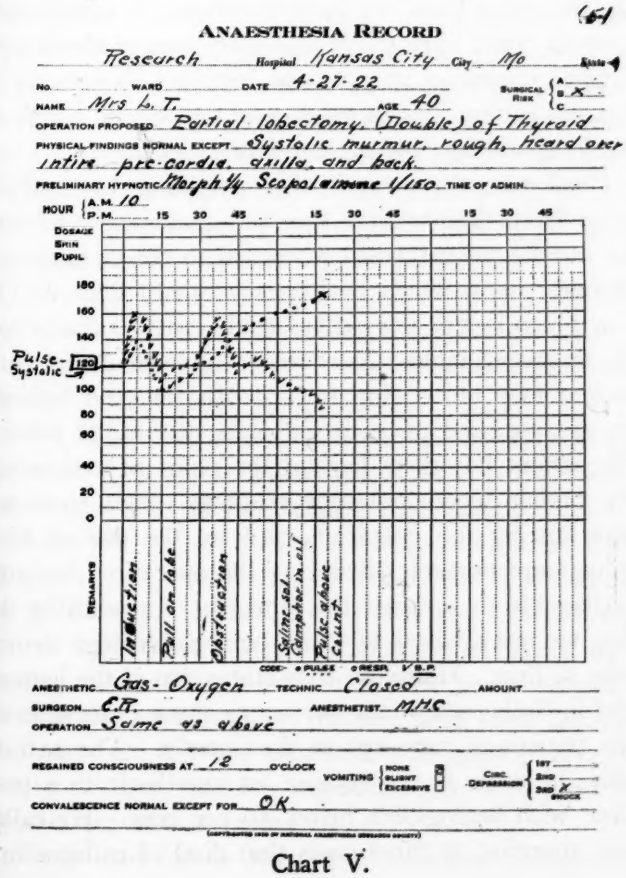

(5)
ANAESTHESIA RECORD
Research Hospital Kansas City City Mo
NAME Mrs L. T. AGE 40
OPERATION PROPOSED Partial lobectomy. (Double) of Thyroid
PHYSICAL FINDINGS NORMAL EXCEPT Systolic murmur, rough, heard over
intire pre-cordia, axilla and back
PRELIMINARY HYPNOTIC Morph 1/4 Scopol DOSE 1/150 TIME OF ADMIN.
Pulse-Systolic
Induction
Pull on tube
Obstruction
Saline sol. Camphor in oil
Pulse above count
ANESTHETIC Gas-Oxygen TECHNIC Closed AMOUNT
SURGEON C.H. ANESTHETIST MHC
OPERATION Same as above
REGAINED CONSCIOUSNESS AT 12 O'CLOCK
CONVALESCENCE NORMAL EXCEPT FOR OK

Chart V.

thyroid secretions, we find the most varied of cardiovascular disturbances. These patients have not only to contend with unusual toxemia and cardiac irregularities, but also mechanical difficulties which are frequently encountered. Such as pressure and pull on the trachea. This patient went into shock after sixty minutes, with blood pressure 80 and pulse 160. Pulse, two hours after operation, 120. Recovery uneventful (Chart V).

Case 6.—Female, aged 35 years. Face congested, slightly cyanotic. Veins of neck large. Marked cardiac decompensation. Heart hypertrophied. Mitral stenosis. Urinalysis showed albumin. Pulse 100. Blood pressures 200/120. Diagnosis: uterine carcinoma. Operation: hysterectomy. This case il-

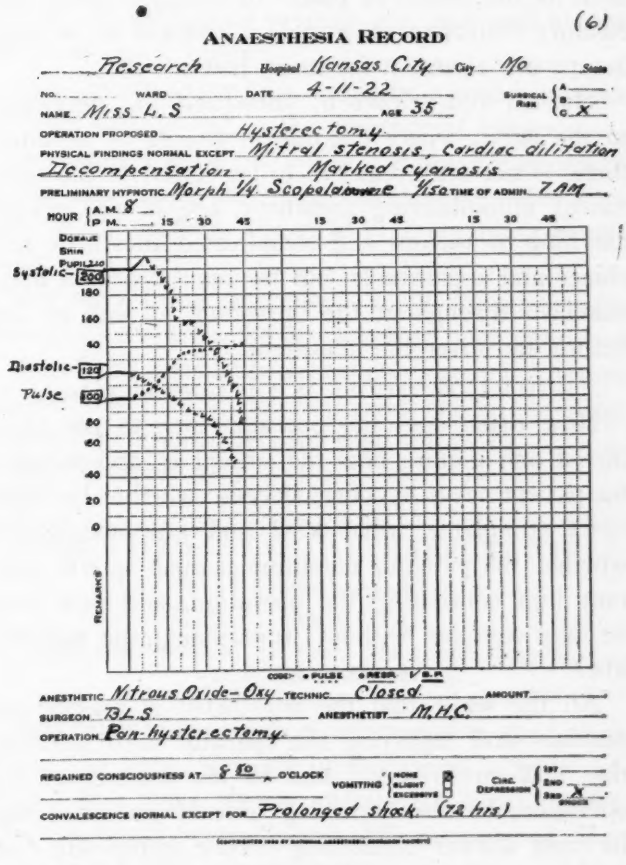

(6)
ANAESTHESIA RECORD
Research Hospital Kansas City City Mo
NAME Miss L. S AGE 35
OPERATION PROPOSED Hysterectomy
PHYSICAL FINDINGS NORMAL EXCEPT Mitral stenosis, cardiac dilitation
Decompensation. Marked cyanosis
PRELIMINARY HYPNOTIC Morph 1/4 Scopol 1/150 TIME OF ADMIN. 7 AM
Systolic
Diastolic
Pulse
ANESTHETIC Nitrous Oxide-Oxy TECHNIC Closed AMOUNT
SURGEON T.L.S. ANESTHETIST M.H.C.
OPERATION Pan-hysterectomy
REGAINED CONSCIOUSNESS AT 5 50 O'CLOCK
CONVALESCENCE NORMAL EXCEPT FOR Prolonged shock (72 hrs)

Chart VI.

lustrates the sudden and serious drop that may be expected in cardio-renal cases with high blood pressure. During induction, blood pressure went to 220 and then began to drop rapidly. Pulse became fast (120) and irregular. At the end of forty minutes operation finished, pulse 120. Blood pressures 90/30. Patient in profound shock for twenty-four hours, then made uneventful recovery (Chart VI).

These charts serve to show a few of the very interesting reactions of the cardiovascular system and the extreme importance of blood pressure readings during operation.

RESEARCH HOSPITAL, 23D AND HOLMES STS.

CIRCULATORY CHANGES DURING ANESTHESIA.*

JOHN R. WORLEY, M.D.,
DALLAS, TEXAS.

It is not possible for any one paper to cover all the various changes that may happen to alter the conduct of the circulation of a patient who is under an anesthetic and undergoing an operation.

What may happen to alter the conduct of the circulation as a result alone of an anesthetic agent is within itself a very broad subject, and would require many pages to cover. What may happen during the course of an operation when the operation itself is the causative factor in bringing about circulatory disturbances, would, if reduced to writing, occupy our attention for many hours.

The art and science of anesthesia has developed to the point, where the one in charge of an anesthetic is not only required to be versed in the technic of administering anesthetic agents and proper handling of various and complicated anesthetic machines and apparatuses, but he must also be a diagnostician throughout the operation, as well as one before and after the anesthetic.

THE ANESTHETIST AS A DIAGNOSTICIAN.

How often does the operator turn to the anesthetist and inquire how the patient is, and whether the patient needs hypodermoclysis; whether he needs heart stimulants, what kind and how much, and whether the patient's condition is such as will warrant him continuing the operation, and how long he may continue without jeopardizing the patient's life?

All the while that the anesthetist is making deductions and supplying the operator with information that go to direct him in his conduct of the operation, he also is asking himself questions that he must answer concerning certain unpleasant conditions that have arisen during the course of the operation.

The patient's circulation is gradually failing and the anesthetist is required to determine whether he is mismanaging the anesthetic or is the surgeon mistreating the patient. The anesthetist may often answer correctly that he is handling the anesthetic properly, but he may have erred in his choice of the anesthetic agent. He may have chosen the proper agent, best suited to the case and may be handling it properly, but many have erred in his preoperative preparation of the case. Again the patient's condition on entering the hospital and upon entering the operating room may have been one that was growing gradually worse. He may have been losing blood or weakening from shock or failing from peritonitis.

The case is more and more complicated. The question that now confronts the anesthetist is whether his patient is growing weaker from some condition that happened to him before entering the hospital or is it from his preoperative medication and preparation, or is it from the choice of the wrong anesthetic agent, or from a mismanaged anesthetic or from a class and kind of surgery that rapidly throws the patient into a stage of shock.

SUPPORTING THE PATIENT.

After the anesthetist has answered all these questions correctly, his next move is determining what course to pursue to best support his patient, and turn the tide of disaster, if possible. What stimulants, how much and how often given? Supportive treatment is the all absorbing subject at this time.

Often the report is that the patient's circulation is very bad and the surgeon is advised to discontinue the operation. The operation is not finished. The patient is hurriedly and incompletely closed, and in some instances the patient loses his life on account of an unfinished operation and improper closure, all because the anesthetist erred in his diagnosis and advised ceasing operating on a patient that could have easily held up for an hour or more. On the other hand we have instances, in which the surgeon could have easily and with good graces have stopped operation at any time, but he was informed that his patient was in good condition, so he worked too long and lost his patient from shock.

Until recently we felt that palpating the radial pulse from time to time was quite sufficient to keep the anesthetist informed in regard to the circulatory changes, upon which he based his deductions as to how much longer the patient could safely remain on the operating table. Now we are informed that the patient may be tending toward disaster, and before we are apprised of it by palpating the radial pulse, the patient has gone beyond the point of recovery. By taking blood pressure readings from time to time during the operation, and by the use of the sphygmomanometer all during the operation, we are better able to forecast the outcome. In addition to this we are advised to make hemoglobin tests from time to time. Hamilton Fish states that if the hemoglobin falls below 20 per cent. during anesthesia the patient is very apt to die shortly. The safest plan, he says, is not to give an anesthetic to a patient with hemoglobin below 50 per cent. He calls our attention to three cases that died of collapse on

*Read during the Joint Meeting of the American and Mid-Western Associations of Anesthetists, Hotel Jefferson, St. Louis, Mo., May 22-24, 1922.

the table when the hemoglobin was only 15 per cent.

In addition to the use of the stethoscope and the sphygmomanometer in the routine examinations of our patients prior to our operation, we should always determine the hemoglobin percentage before operation. After the anesthetic starts all that happens to interfere with the patient's normal circulation can, with few exceptions, be placed in two general groups; *first,* errors in anesthesia and *second* errors in surgery. Under errors in anesthesia I wish to state that one of the greatest mistakes that can be made and one which endangers the life of the patient more than any other thing, unless it be anoxemia, is throwing the patient into a violent excitement stage. And here let me say anoxemia often runs highest during the excitement stage, especially when there is an associated laryngeal spasm and a general tonic contraction of the patient's thoracic and abdominal muscles. This is a very hazardous situation for the patient with diseased circulatory organs, more especially with an accompanying high blood pressure. With properly administered gas-oxygen-ether sequence, it is within the realm of the anesthetist to get his patient through the dangerous period without mishap.

We meet with some very precarious situations on bad subjects by permitting the operation to start before the patient is in profound, relaxed anesthesia. Often, especially during rectal operations, the lightly anesthetized patient is thrown into a violent tonic spasm, respiration ceases and cyanosis follows. This is a very unpardonable error on the part of the anesthetist. Profound, relaxing anesthesia is attended with a greater percent of recoveries than attend very light, shallow anesthesia. More patients will go off the table with a high thready pulse running 100 and 120 and above, from too light anesthesia.

You will succeed in getting more patients off the table following laporatomy with a pulse of eighty-two to eighty-four if you employ profound anesthesia.

We know that the circulation in the coronaries is better with a slow pulse, the heart is better nourished and there is less fatigue and decompensation.

Morphin and scopolamin should always be employed as a preliminary to anesthesia and better, ⅛ gr. morphin should be used now and then during severe operations when any element of shock appears. Even though you may slow down respiration to eight and ten per minute, and even though you may be compelled occasionally to employ oxygen freely until respiration improves, you will have a greater percent of recoveries.

Mann and Gatch state that muscular relaxation and impaired respiration tend to decrease the amount of blood returned to the heart. On the other hand light anesthesia brings about rigidity, high blood pressure, exhaustion, and enables the nerve impulses from the periphery to reach the cortical cells, and bring about a condition of shock.

Under the head of surgical errors I will mention the one outstanding fault—irritation to the peritoneum, bringing about an inflammation of the same, and putting out of commission a large volume of blood. More and more do we see the necessity of maintaining intra-abdominal pressure by the use of properly placed warm packs—not hot, for that has been shown to bring about a decomposition of the plasma, whereby toxic proteids are freed and a condition of shock follows.

Trendelenberg position should be avoided in cases of heart disease and in the presence of cyanosis.

In closing I must not fail to mention the necessity as the anesthetist sees it of encouraging rapid surgery, gentle surgery, and rigid care regarding hemostasis.

We must bring into play all our knowledge on these subjects when we are handling poor risks and it is only by constantly rehearsing and by repeated admonitions that we develop good habits and good impressions eventually take root within us.

2407 GASTON AVE.

THE PHYSIOLOGICAL EFFECTS OF NITROUS OXID.*

NEIL C. TREW, M.D.,
Staff Anesthetist at the Good Samaritan Hospital,
LOS ANGELES, CALIF.

This paper is the result of an attempt to straighten out in my own mind the physiological effects of N_2O. If I have merely threshed out a subject which is already threadbare to the majority of you, my excuse is that it is a subject of fundamental importance. If we do not have a clear knowedge of the action of the drugs we employ, we are on the same footing as the lay anesthetist—if we do not know whether the spasticity of the muscles in a given case is due to lack of O or an excess of CO_2, or to too much or too little N_2O, we must guess at the remedy to be employed, and can consider ourselves as indeed fortunate if we avoid disaster.

Although N_2O was discovered by Priestley 150 years ago, and has been used as an anesthetic for nearly 80 years, it was not until recently that anything was known of its physiological effects except that it would produce anesthesia, and if given too

*Read during the Joint Meeting of the Pacific Coast Association of Anesthetists and the Section on Anesthesiology of the California State Medical Society, Yosemite, May 15-16, 1922.

continuously would lead to asphyxia and death. Long after the effects of such drugs as opium and digitalis and belladonna had been worked out minutely, the action of N_2O remained unknown, and there are still many problems to be solved and hypotheses to be verified. There are several causes to account for this delay in our knowledge of the drug; first, the fact that it is a gas and therefore more difficult to study (and a very inert gas whose presence it is difficult to detect) also, that its effects are so extremely transient and are confined almost entirely to the higher nerve cells, and again that O in just the right proportions has to be administered with the gas to avoid confusion arising from asphyxial symptoms.

CERTAIN PROBLEMS.

In any inhalation anesthesia there are the following elements to be considered—the anesthetic agent, the supply of O, the elimination of CO_2 and the N of the air—all of these enter into the problem and render it exceedingly complex, and when we add to this the fact that we are dealing with the question of consciousness (itself the most mysterious of known phenomena) and the response of the organism to traumatic stimuli we can realize the difficulties of the problems involved. Consciousness, in some wonderful way results from the interactivity of an enormous number of separate brain cells, and we are to inhibit that consciousness by modifying that activity.

In all of the earlier experiments with N_2O the unfortunate mistake was made of confusing the anesthesia caused by the gas with unconsciousness, produced by asphyxia, indeed for many years the two were considered identical. In 1890, H. C. Wood, as the result of a series of experiments, came to the conclusion that "—N_2O has no inherent anesthetic properities, but that the loss of consciousness which follows its inhalation is the result of asphyxia —that pure N acts in the same manner, that is by shutting off the O." As late as 1915, Crile stated that in N_2O and O we have two antagonistic agencies which gives us perfect control of the anesthesia—the less O the deeper the anesthesia—the more O the lighter the anesthesia; and even in the recent experiments of Jones and McPeek, reported in Bulletin 5 of the N. A. R. S., the asphyxia necessarily present from breathing pure N_2O seems to have been ignored in determining the cause of death. When N_2O is given pure the unconsciousness produced is the result of its anesthetic properties, plus the attendant asphyxia, with a constant increase in the latter, the longer the anesthesia is maintained.

In 1891, van Arsdale reported experiments in which by the use of artificial pressure, anesthesia was produced without asphyxia with a mixture of N_2O and 20 per cent. O, even though the pressure was raised to only 1¼ atmospheres. Since it was known that men can work for hours under a pressure of several atmospheres without being anesthetized by the air they breathe, it at once became apparent that N_2O must differ from N in possessing inherent anesthetic properties. However, it was not until Hewitt and others demonstrated that artificial pressure was not necessary, and that when combined with O, N_2O could be used for prolonged surgical operations, that the use of N_2O and O as a general anesthetic spread rapidly, and clinical observations covering large series of cases were recorded, in addition to numerous experiments on animals. However, we now know that only limited credence should be placed on the conclusions arrived at, because of the impurity of the gas used until recently. Even now it is probable that the untoward effects noted in some cases are due to impurities in the gas and should not be recorded as the action of N_2O.

METHOD OF ACTION.

N_2O is dissolved in the proportion of 45 volumes of the gas to 100 volumes of blood, without chemical combination, though the fact that more of the gas is dissolved in blood than in an equal quantity of water makes it probable that a certain small amount of the gas must be held in chemical combination—probably with the lipoids. Its rapidity of action and the promptness of recovery makes it probable that its effects are produced by physical rather than by chemical means. Its effects within the body are manifested almost entirely by the inhibition of the activity of the higher nerve cells. How this is brought about is still a question. Crile speaks of a decreased permeability of the semi-permeable cell membranes, but offers no proof. Dennis E. Jackson, in the Year Book, Volume 2, suggests that the absence of the supposedly inert N of the air may in some way be responsible for the anesthesia, but says "It is, unfortunatelly, extremely difficult to prove this point." It seems to me very easy to disprove it. If a patient is anesthetized with pure O and N_2O and is kept under for a sufficient time to eliminate practically all the N, and if then the O supply is increased sufficiently without admitting any N, the patient will come out from the anesthetic.

The most commonly accepted theory is that in some way the drug leads to a sub-oxygenation of the body cells. This sub-oxygenation is not sufficient to affect most of the body cells, but is enough

to inihibit the activity of the higher nerve cells. It is interesting, in this connection, to recall a series of experiments carried out by Crile some years ago to determine the effects on the different tissues of extreme exsanguination. He found that the higher nerve centers—those latest acquired—were the most sensitive and the first to succumb, and it has occurred to me that herein may lie the explanation of the selective action of N_2O. In all the cells of the body there may be a slight interference with normal oxygenation, but the effect of it may be apparent only in the higher nerve cells which are particularly sensitive to such influence. In support of this theory are the findings of Davis, who studied the effects of long continued anesthesias on pregnant animals, that "The changes following the use of N_2O being identical with those seen after ordinary asyphxiation, it seems fair to believe them due to long continued interference with cell oxidation."

Analgesia and Anesthesia.

As N_2O exerts its principal effects upon the nervous system, we will consider that, *first,* one of the most common comparisons is between anesthesia and natural sleep. Crile and numerous others have called attention to the similarity of the two states—both may occur in varying degree; in both consciousness is lost, and in both dreams may occur, but the similarity is more apparent than real, and there exists this very important distinction—under anesthesia, and particularly under N_2O anesthesia, a state of analgesia exists, which is not present in natural sleep. This is a point worth considering carefully, for it is one which I think has been overlooked. Our Year Book is called the American Year Book of *Anesthesia* and *Analgesia,* but we have been wont to consider the *two conditions as separate and as not coexisting together.* In sleep, though the perception of pain may be dulled to a certain extent, *no true analgesia occurs*—in fact, it is most important for the protection of the individual that it should not occur, otherwise the sleep, in which we spend about a third of our lives, would expose us to grave dangers. We have all had the experience of being awakened from profound sleep by pain. When worn out one may sleep in spite of pain, but a certain subconsciousness of the pain is ever present.

With most of our anesthetics, and particularly with N_2O, a state of analgesia without loss of consciousness may be produced. Patients coming out from the effects of N_2O after a painful operation are conscious for some appreciable time before they show signs or complain of pain. The conscious maintenance of analgesia during prolonged and paiful dental work has been frequently reported, and we all use this state in the management of labor cases. As stated in the Monograph on Nitrous Oxid Analgesia and Anesthesia in Normal Labor and Operative Obstetrics, "The operator has equally at his command the analgesic state in which the patient is conscious, but relieved of pain, and profound narcosis, when every sense is stilled in lethean forgetfulness; and either stage can be prolonged indefinitely, or readily transferred into the other without untoward complications."

Now, if we are able to produce analgesia without loss of consciousness, it is reasonable to believe that when consciousness *is* lost under a more powerful action of the drug the anesthesia still persists. In other words, when we produce anesthesia in a patient, we also produce analgesia.

The analgesia is not absolute as is shown by certain responses to painful stimuli, notably muscle rigidity, but when we remember that the inhibitory centers are depressed and think also how many children and some adults thresh around in their sleep in response to comparatively light stimuli, we can understand how there may be some response to trauma under N_2O without any stimuli sufficient to produce shock reaching the brain. In this connection we may note that the means which we employ to overcome these responses to pain are not directed towards a deepening of the unconsciousness, but to a greater analgesia. We use morphin as a premedicant; now, morphine in itself is not a hypnotic, but dulls pain; or we add a certain amount of ether vapor to our gas mixture; now in using ether for this purpose one is always surprised at the very small amount necessary to produce relaxation—the amount is so small, indeed, that one suspects that it is the *analgesic* rather than the *anesthetic* effect which is needed.

The importance of these considerations in relation to shock production is apparent.

The effects of N_2O upon the nervous system are very quickly recovered from and no ill-effects have been noted from prolonged or frequent administrations. Crile found that the brain cells of rabbits suffering from prolonged lack of sleep recovered just as quickly under N_2O anesthesia as under natural sleep, and the gas has been used as a therapeutic agent in long continued nervous cases with apparent good results.

Systemic Effects.

Turning now to the general systemic effects, let us consider, *first,* the effect on blood pressure. Mistakes in observation die hard in medicine, and one of the most tenacious of these is the idea that N_2O

raises blood pressure. Asphyxia does raise the pressure and because of the confusion already alluded to between asphyxia and N_2O anesthesia, this mistake has been handed down from one medical writer to another. Casto (1917) and Spencer and Davis (1919) all found that no rise in blood pressure occurs unless there is cyanosis, rigidity or jactitations, and that no rise was present if sufficient O was admitted to prevent these symptoms. Of course there is always the *possibility* of a rise in blood pressure for we are dealing with two gases, one of which has as an asphyxiating effect, but none should occur if anoxemia is avoided. As one would naturally expect, the effects upon the heart itself are less than under ether or chloroform. As McCurdy says: "As regard to effects upon the heart muscle and its nervous mechanism, N_2O is indisputably the least injurious. Heart complications are conspicuous by their absence."

As to the blood itself, all anesthetics tend to reduce the hemoglobin, but as stated in the N. A. R. S. Monograph, the reduction is only slight, and the return to normal occurs in from 2 to 3 hours. There is also *a decrease of blood catalase,* but this also is much less than under chloroform and less than under ether in operations lasting more than forty-five minutes. *The alkali reserve is also less interfered with under N_2O.* The effects upon the liver cells have been recently studied by Charles la Roque of Montreal, who finds that "N_2O used on patients requiring no surgical intervention produces no cholemia and is the only general anesthetic which does not injure the hepatic cell."

Upon respiration N_2O exerts at first a stimulating effect so that under ordinary anesthesia the respirations are from 28 to 32 per minute, but under deep narcosis the respiratory center is depressed. If death occurs from N_2O poisoning, it is through respiratory failure. There is a greater variation in susceptibility to N_2O than to other anesthetics and I think it is safe to say that with pure N_2O and pure O given properly one never gets an over-action of N_2O in normal patients. That is, if death occurs, it results from using an impure N_2O or from some abnormality of the patient.

In this connection I recall a conversation I had with a British naval officer while in England during the war. He had used gas-oxygen successfully in 400 cases, and then he had had a death; and then three other deaths in immediate succession. He had then abandoned the use of N_2O. There is only one explanation of such an occurrence: he had got hold of a tank of poisonous gas—and yet those deaths will be recorded against N_2O.

Muscular relaxation is brought about through the action of the drug upon the nervous supply, for a muscle cannot be paralyzed with N_2O as with ether and chloroform. Through its action on the nervous system a relaxation slightly greater than during normal sleep is produced, but absolute relaxation cannot safely be attained without the preliminary use of morphin, and even then not in all cases. A good working relaxation is produced in the great majority of cases, but if the surgeon demands more than this, then recourse should be had to small amounts of ether vapor, rather than attempts to force the action of the N_2O. Secondary saturation seems to be satisfactory in the hands of its originator and some of his followers, but few of us would feel justified in using it as a routine measure. Muscular rigidity and spasm is a sign of O starvation and cannot be overcome by an increased concentration of N_2O without approaching the danger line of asphyxia.

To sum up briefly, N_2O is the best anesthetic we have at present from the patient's point of view, for it is the least toxic and affords the best protection from shock through its analgesic action.

R. F. D. 5, Box 186.

INTRATRACHEAL INSUFFLATION ANESTHESIA.*

MARY KAVANAGH, M.D.,
Instructor in Anesthesiology, University of California Hospital,
SAN FRANCISCO, CALIF.

One of the greatest dangers of intrathoracic operations is the occurrence of pneumothorax as soon as the pleural cavity is opened. This, when limited to one side, while not fatal, always causes more or less serious respiratory embarrassment. When both cavities are opened the result is generally fatal. As it not infrequently occurs in operations upon one side of the thorax that the opposite lung is more or less incapacitated as a result of injury or disease, the desirability of avoiding the serious consequences of pneumothorax has long been appreciated.

HISTORICAL EVOLUTION.

The word *pneumothorax* was coined in 1803 by Itard, a French physician. The condition it describes barred for practically one hundred years the chest cavity to the knife. Modern thoracic surgery dates from 1896, when Quénu first made known the idea of restoring in pneumothorax artificially by differential air pressure the disturbed equilbrium of the lung, and Tuffier advocated the use of insuffla-

*Read during the Joint Meeting of the Pacific Coast Association of Anesthetists and the Section on Anesthesiology of the California State Medical Society, Yosemite, May 15-16, 1922.

tion for the performance without pneumothorax of operations requiring the incision of the pleura.

Quénu's apparatus was constructed on the lines of a diver's helmet in which the head of the patient was placed with a sponge saturated in chlorofrom. The air in the helmet was compressed and the pleural cavity opened.

Tuffier introduced a narrow, slightly curved copper tube into the larynx and trachea.

Matas of New Orleans was the first in the United States to become interested in thoracic surgery. He introduced the *Fell-O'Dwyer* type of apparatus for artificial respiration. The anesthetic was given by means of a funnel attached to a T-tube. The main tube was introduced into the larynx and trachea.

In 1898 *Parham* of New Orleans used the Matas apparatus in performing a resection for tumor of the bony wall of the chest,—the first thoracic operation of record in this country.

CABINET METHODS.

In 1903 *the Sauerbruch cabinet* was invented; and 1904 marks the real beginning of thoracic surgery by the transpleural route. For its performance Sauerbruch, Germany, had built a chamber of about 500 cubic feet contents, constructed of iron and glass, inside of which the operation is performed. Over the opened pleural cavity the air pressure is reduced below atmospheric pressure, while the patient, whose head is passed through an opening in the wall, breathes in atmospheric pressure.

In quick succession chambers were built in Berlin, Cologne, Vienna, St. Petersburg, and other places in Europe. The size of the chambers averages about 600 cubic feet contents; the largest one at Vienna contains about 750 cubic feet. Their height is usually 7 feet, 6 inches.

The reverse proposition was also taken up by Sauerbruch, and after him Peterson, and Engelken constructed positive differential pressure cabinets, Peterson of wood and Engelken of iron and glass, boxes of about 50 cubic feet contents, into which the head of the patient is passed through an opening in the side wall. The inside air pressure is then raised above atmospheric pressure. The patient breathes compressed air, while outside of the cabinet the pleural cavity is opened in atmospheric pressure.

The anesthetic, in operations with these chambers and cabinets, is applied in the ordinary way—with ordinary face mask and ether by the drop method. The anesthetist frequently became partially anesthetized.

The construction of these chambers and cabinets was such that the surgeon could not see the head of the patient, and the anesthetist could not follow the operation. Telephones were then installed, but the open air pipes connecting the pump cylinder with the chamber on the cabinet made of the latter practically a part of the pump cylinder, in which the clicking of the valves, the hissing noise of the air in the air pipes, and the boiling of the air through the water valve combined to make such a noise that the telephone was inaudible. Ventilation was deficient, the air being renewed only once in ten or fifteen minutes. The anesthetist's attention was taken from the patient to regulate the pressure and other duties, which should have been done by others.

These inconveniences were avoided in the positive differential pressure apparatus of *Brauer*. The head of the patient is enclosed in an air-tight box about 5 cubic feet contents, in which the air is changed from four to five times every minute. The anesthetic is applied by mask in the ordinary way. Openings are provided in the side of the box, through which the hands and arms of the anesthetist are introduced, and then made air-tight by means or rubber gloves fastened inside of the box. It is thus from the outside that the anesthetist applies the anesthetic and manipulates the head of the patient which he sees before him below a plane of glass.

In 1907, Green and Janeway, of New York City, had constructed a positive pressure apparatus of the Bauer type, but modified and improved as to the valve action and mechanical appliances for artificial respiration during anesthesia.

In 1908, Willy Meyer's Postive Pressure Cabinet appeared. A cabinet of about 80 cubic feet contents, large enough for two anesthetists, was built of wire screens and made air-tight from the inside by means of a bag of rubber sheeting, through which conversation between surgeon and anesthetist can be carried on. The anesthetists within are placed in a current of fresh air; the exhaust is near the head of the patient, so that the vapors of the narcotic are absorbed by the patient only. The air is changed once every minute. Outside, against one side of the cabinet and projecting far out from the same, a pyramidal box was placed, opening inward and closed in front by a rubber collar, through which the head of the patient is passed. The bottom of this head-box is horizontal, and serves to carry an adjustable support for the patient's head, offering besides room for instruments, etc. The top of the box pitches downward and consists of a large pane of glass, below which the patient's head can be seen from the outside. Above the pane is placed a mirror in which the anesthetists, glancing up, see the field of operation reflected. The cabinet has an air-

lock by means of which the anesthetists can be reached without interruption of the difference in pressure. There is room inside for oxygen tanks and for apparatus for applying the anesthetic. The anesthetists have access to the head of the patient, with plenty of room all around the same for carrying on whatever manipulations are required during anesthesia.

Lately the inside cover of rubber sheeting has been replaced by copper sheeting, and the use of rubber sheeting been restricted to sound windows for conversation between surgeon and anesthetist in the two vertical sides of the head-box. Another sound window is arranged in the copper near the pressure valve for conversation between anesthetist and the mechanic. Later the opening in the wall for passing the patient's head into the open air was omitted. Instead, the patient's head is placed in a positive differential pressure cabinet erected within the negative chamber. The size of the latter has been increased to approximately 1000 cubic feet contents, (16x8x8 feet). When the patient's head is in the positive cabinet, his body rests in the negative chamber on the operating table in front of the positive cabinet. The air supply is so apportioned that the pressure within the cabinet, as well as within the chamber, responds immediately to the slightest change in the setting of the valves. By opening or closing these valves difference in pressure are produced, the extent of which is read on the gauge. Using the gauge as guide, the valve can therefore be handled in such a way that the pressure rises and falls between limits determined by the surgeon.

INSUFFLATION METHODS.

Reduction in the size of cabinets from 600 to 50 cubic feet contents, and from 5 to 50 cubic feet proved that cabinets could be dispensed with. Its place has been taken by the mask and intubation tubes and an apparatus forcing ether vapor through the same. Of the mask type are the apparatus of *Brat-Schmieden* and of *Tiegel.* In both the drop method is used, in combination with an oxygen tank, the oxygen stream carrying the anesthetic to the lung. The pressure in the lung is maintained by expiring against either a spring valve (Schmieden) or a water column (Tiegel).

The intubation type is the apparatus of *Kuhn.* A tube is introduced into the trachea and compressed air is mixed with ether vapor blown through the same into the lung.

In 1908 experiments to overcome the deleterious effects of pneumothorax in operations upon the thoracic viscera were started. The experiments mainly followed two plans:

First, to increase the air pressure within the bronchial tubes and thus prevent a collapse of the lung, when the negative pressure on the surface of the lung is removed by opening and admitting air to the pleura.

Second, to diminish the atmospheric pressure on the exterior of the lung when the chest is opened, while maintaining the normal pressure of the air entering the trachea.

Experiments with the first method have generally been carried out by means of a snugly fitting tracheal cannula or intubation tube and some form of an air-pump or bellows.

Experiments by the second method—by placing the animal's body below the neck in an hermetically sealed chamber from which a certain amount of air has been drawn. This was the Sauerbruch cabinet, the then most satisfactory negative pressure apparatus. When sufficient air is withdrawn to render the negative pressure equal to 10 or 12 cm. of mercury it was found that in opening both pleural cavities the lungs did not collapse, but respiration continued without the slightest embarrassment.

F. T. Murphy, of Boston, has devised an air-tight helmet which incloses the patient's head and neck, and in which the air pressure is increased and maintained by water displacement.

Since that time experimental work has been towards employment of methods of positive intratracheal pressure, rather than those utilizing negative pressure, as in the Sauerbruch cabinet.

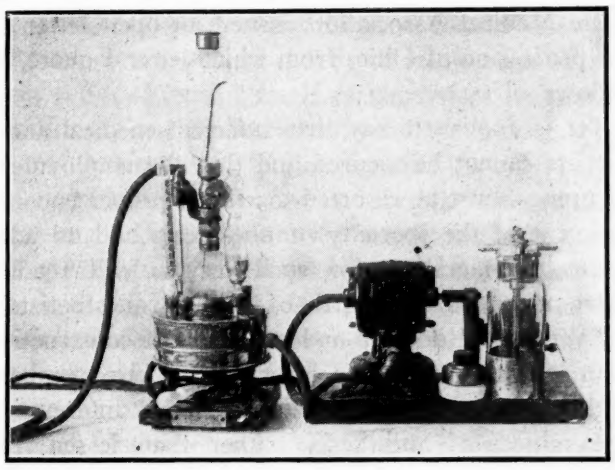
Then came the Tiegel positive pressure apparatus and next came a portable positive pressure cabinet of Janeway and Green.

MELTZER'S TECHNIC.

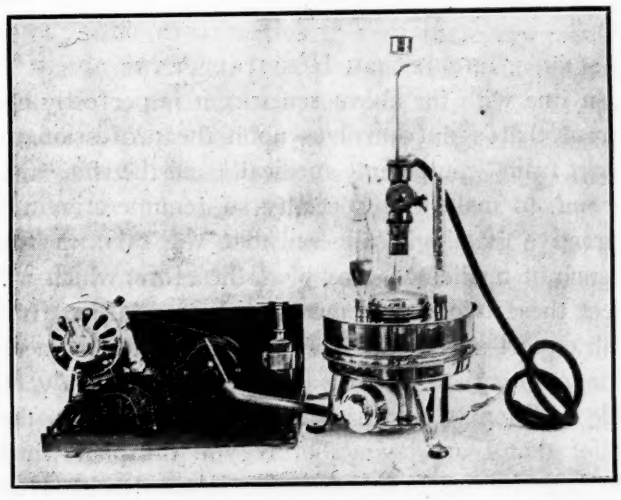
Many others worked along these lines of experiments. while it remained for Auer and Meltzer of the Rockefeller Institute to perfect and popularize the intratracheal anesthesia. This is the method of introducing in the trachea a flexible tube, the diameter of which is much smaller than the lumen of the trachea, and they established the facts that pulmonary ventilation might be maintained by a constant stream of air or oxygen, under definite pressure being blown in the trachea and which returns along the space between the tube and the wall of the trachea and escapes through the mouth and nose. This insured the proper oxygenation of the blood, inflation of the lungs, favored the continuance of cardiovascular circulation, and permitted the induction of narcosis by means of a volatile anesthetic. The result is an ideal anesthesia, because the dosage can be accurately adjusted, and by this means adequate and efficient respiration can be carried on

when, for any reason, the normal respiratory mechanism is embarrassed or fails completely. The embarrassment caused by spasm of the glottis, accumulation of mucus in the pharynx, and the dropping backward of the tongue are entirely avoided, and the demonstrated impossibility of foreign substance present in the mouth or pharynx entering the trachea or bronchi.

The Auer-Meltzer is a comparatively simple apparatus and it abolishes the cumbersome uncertain appliances of the past and opens the thorax to the progress of surgery.



The Pope Apparatus.



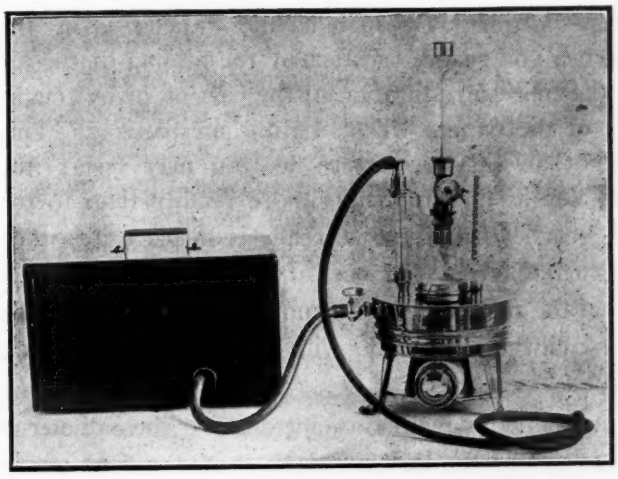
The Modified Apparatus.

The work of Auer and Meltzer, Elsberg, Flint and others has proved that intratracheal anesthesia is not only a successful solution of an important phase of intrathoracic surgery, but is a safe adventure.

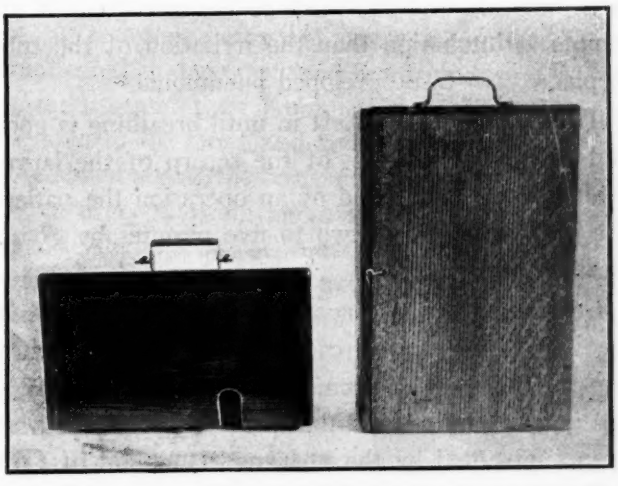
THE POPE APPARATUS AND METHOD.

In 1912, Doctor Saxton Temple Pope, of the University of California Hospital, constructed an apparatus involving the Auer and Meltzer theory. Its principal features are compactness, a means of the accurate regulation of the proportion of ether and air given, electric heating to violatilize the ether and a pressure and safety valve attachments. This apparatus has been used for intratracheal anesthesia with the most satisfying results.

To develop the technic of this form of anesthesia I gave a series of intratracheal anesthetics in 1913 to 42 cases in general surgery. Since then I have



The Silent Motor.



Carrying Cases.

had for intracheal anesthesia the following cases:

Mediastinal tumor	4
Carcinoma of mouth	1
Carcinoma of larynx	3
Carcinoma of tongue	3
Carcinoma of esophagus	4
Sarcoma of jaw	1
Carcinoma of cheek	1
Carcinoma of lip	2
Tracheoplasty	2
Diaphragmatic hernia	1

The technic for intratracheal anesthesia is as follows: The patient is thoroughly anesthetized by the gas-oxygen-ether sequence. Buccal or nasal anesthesia is continued to maintain anesthesia during the stage of introducing the laryngeal catheter. Then the side mouth gag is inserted.

The first and second finger of the right hand are put well down the throat, the epiglottis located and pushed well forward; then the introducer loaded with the disconnected catheter (a No. 24 or No. 22 French catheter) is passed along the finger into the rima glottidis. As soon as the catheter is in the trachea you realize the fact by the hissing of the air in the tube on respiration of the patient, or by coughing of the patient who is lightly anesthetized. This is not an easy procedure, as you may insert the catheter in the esophagus more readily than in the trachea. When the tube really is in place it is then pushed down a distance of 25 or 30 centimeters from the teeth and the introducer slipped off. Then the connection is made with the machine for intratracheal anesthesia.

A far better method of introducing the catheter is by means of the laryngoscope.

Some of the patients complained of sore throat after recovery from the anesthesia, some had laryngitis, but this was due more to the unsuccessful attempts at intubation than the irritation of the tube in place. No case developed pneumonia.

The tracheal tube is left in until breathing is good and coughing warns us of the return of the laryngeal reflex. At the end of an operation the patient can be roused within two to five minutes by giving straight air.

Continuing the history of intratracheal anesthesia, we find the group of cases in which intratracheal anesthesia has been found to be highly advantageous is very limited, and that the Meltzer method has been supplanted by the pharyngeal method of Connell. Pharyngeal insufflation has supplanted intratracheal in all operations, even those requiring positive pressure for intratracheal work—except in such cases where collapse of the trachea is threatened—and eliminates the most serious complication of intratracheal anesthesia, edema of the epiglottis.

The apparatus shown herewith is a modification of Dr. Pope's original apparatus, and following the suggestions of Dr. Sheldon, a member of the House Staff, I now posssess *a practically noiseless motor* which he devised.

1482 SUTTER ST.

ANESTHESIA AS A PART TIME SPECIALTY.*

MOSES SALZER M.D.,
Director of the Anesthetic Service, Jewish Hospital,
CINCINNATI, OHIO.

The Ohio State Medical Association at its meeting in 1921 passed a resolution, asking for the repeal of the existing law permitting nurses to give anesthetcs. This resolution had practically the unanimous support of the House of Delegates. Following this meeting, Wells Teachnor, President of the Ohio State Medical Association, issued an open letter to the profession of Ohio, from which letter I quote, as follows:

"It is foolish to say that sufficient medical anesthetists cannot be secured and that the employment of nurses must be resorted to; for, a proper encouragement of the specialty of anesthesia and an adequate remuneration for such service will readily solve any apparent dearth of medical anesthetists".

"We should develop and encourage a constructive plan which would be an incentive for our members and which would increase professional interest in the subject of anesthesia, rather than lessen the morale of the profession by extending a certain practice to outside agencies which belongs as much to the doctor as appendectomy and Cesarean section."

THE JEWISH HOSPITAL PLAN.

In line with the above remarks it is perfectly apparent that a duty evolves upon the profession to, *first,* train competent medical anesthetists and, *second,* to make this specialty so remunerative and attractive that high calibered men will take up this branch of medicine. Any plan, therefore, which will meet these two requirements and, in addition, furnish expert anesthetic service by graduates in medicine to all patients operated upon, ought to be a valuable addition to our present methods. It is in this belief that I am laying before you the plan which has been in successful operation in the Jewish Hospital of Cincinnati for the past four years. I believe the plan to be unique, in that it assures expert anesthetic service by graduates in medicine to every single patient operated upon, charity as well as private, unique in that the internes are trained in the use of anesthetics and give them only under the direct supervision of one of the staff anesthetists.

It costs the hospital nothing and the routine cases very little more. The men doing the work are satisfied with their remuneration and their positions. I

*Read during the National Anesthesia Research Society Congress of Anesthetists, in Joint Meeting with the Interstate and New York Anesthetists, Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

believe that it has permanently solved our anesthetic problem. Last year 2,250 patients were operated upon in this hospital, of whom 436 were charity or no-pay cases. In addition 243 patients were delivered on the maternity service, practically all of whom were given nitrous-oxid-oxygen, making a total of 2,493 patients who were given expert anesthetic service by graduates in medicine only.

The department of anesthesia consists, at the present time, of a director and three assistants. Our plan of operation is as follows: The hospital is an open one and any operator can bring his own anesthetist if he so desires, but, in event that he does not elect to do so, one of the staff anesthetists either gives the anesthetic himself or supervises its administration by one of the internes on the service. Internes are permitted to give anesthetics only under the direct supervision of one of the staff anesthetists, excepting under extreme emergencies. *Every member of this staff, and this is a point I wish to emphasize and will dwell upon later, is, in addition to his work as an anesthetist, engaged in the practice of internal medicine.*

The director of the department is called upon to actually administer anesthetics only in special cases and receives no compensation whatsoever. His position is largely supervisory. The other three men in the department, however, are paid at the rate of $5.00 per hour or fraction thereof for every routine anesthetic they administer *or supervise,* and the hospital adds the charge to the patient's bill. If the operation takes place at any time excepting during the regular operating hours in the morning, these charges are doubled.

The anesthetics for charity patients are given by one of the staff, for which he receives no compensation.

The remuneration received in this way from the routine cases, while an appreciable amount, would not be sufficient inducement for these men, and any one of them is permitted to be engaged specially by the surgeon or patient, in which event the hospital makes no charge, and the question of fees lies solely between the anesthetist in question and the patient, who receives a bill direct from the anesthetist.

These men do not lose their independence or identity. They are not dependent upon any one surgeon for their livelihood. Being able to accept special or private cases they are able not only to add to their incomes, but also to establish a reputation among patients as well as doctors and to create a demand for their services.

The weak point in our plan is the collection of the fees in the routine cases by the hospital, as I believe this tends to minimize the value of the services rendered. If the patient receives a bill direct from the anesthetist it will make him cognizant of the fact that some particular thought and attention was given to this part of his care. The anesthetist is entitled to the recognition of his services by the patient. He should be able to stand on his own feet, to build up his own clientele, to rise or fall by his ability or lack of ability.

Should a patient or surgeon desire some anesthetist other than those of the staff, it is his privilege to have him, in which event, of course, the hospital assumes no responsibility.

THE ANESTHETIST AS AN INTERNIST.

The supervisor of the operating rooms, assigns the anesthetists in rotation to their particular cases the afternoon preceding the operations and they are expected to acquaint themselves with the patient's condition and nature and character of the operations. They are also expected to watch the progress of the case until the patient leaves the hospital.

That they learn considerable of general medicine goes without saying and they likewise bring to bear on their work a knowledge of internal medicine which, to my notion, is extremely valuable in the giving of an anesthetic. If the indications and contraindications for giving digitalis can engage the attention of leaders in internal medicne and be the subject of countless volumes, surely the much more complicated indications and contraindications of anesthetists and their administration should not be relegated to the nurse and layman.

As stated above, the one point I wish to emphasize is, that every man on the anesthetic staff is also engaged in the practice of internal medicine and it has been our experience that a man's ability as an anesthetist is commensurate with his ability as an internist. Cincinnati has no full time anesthetist. All of our best anesthetists are also engaged in the practice of internal medicine. Who is better able to judge of the patient's heart action, his respiration, or, in a word, his general physical condition than the internist? *Does a surgeon delegate the post-operative treatment to a trained nurse? When complications arise, does he trust to her judgment by calling her into consulation? Why then should he depend upon her judgment during the operation itself which, in the vast majority of cases, the only critical period of the patient's entire illness. It is just as logical to consult with trained nurses and laymen for postoperative complications as it is to do so during the operation.*

Metropolitan Cincinnati, consisting of about a half-million people, cannot and does not support an

aesthetist who devotes his entire time to the giving of anesthetics, nor do I think it desirable. When I say *support*, I mean keep busy. Practically all operating in Cincinnati is done in the forenoon, and an anesthetist, no matter how large his following, would still have his afternoons unoccupied. I believe that a graduate in medicine who would be willing to work at his profession only half-time, most of the year, would be shirking a duty to society at large. I do not believe that conditions in Cincinnati are so very much different from those in most other cities in the country, possibly excepting New York, Chicago and the next three or four of the largest cities.

Furthermore, to come to the crux of the situation, I do not believe that anesthesia by itself can, nor does, contain sufficient interest to attract to itself *exclusively* the man with a broad knowledge of medicine. Anesthesia as a specialty has no future, if it is to become the resting place of the lazy, the incompetent and the single-track mind. The vast majority of the operating in this country is not being done in the large clinics, where operating is done with the machine-like precision, but most of it is being performed by surgeons who have all they can do, and sometimes more, to supervise their own work, let alone the work of a lay or nurse anesthetist.

Believing as I do that the average American city can not keep anesthetists busy more than a few hours in the morning, or half a day at best, and believing, furthermore, that a good internist is potentially a good anesthetist, it seems to me that our future supply of medical anesthetists can be recruited from men practicing internal medicine. In this way every town in the country could boast of good men devoting special attention to anesthesia.

That this is a practical solution, can be attested by conditions existing in Cincinnati at the present time. There is no dearth of medical anesthetists in our city. We have literally dozens of men practicing internal medicine, who are devoting special attention to anesthesia and are doing good work. The nurse and lay anesthetist is not a problem with us, and I honestly and conscientiously believe that the anesthetist problem is solved as far as we are concerned. What we have done every other city can do.

There is also an economic side which anesthetists for their own protection cannot afford to ignore. No one can tell how soon there may be given to the world some epoch making discovery in anesthesia making the services of a trained anesthetist unnecessary. Inhalation anesthesia is barely eighty years old, a mere infant compared to medical science in general, and who knows what the next few years may bring forth. For self protection alone the wise man giving anesthetics will have some other resource to fall back on.

CONCLUSION.

In conclusion, let me call to the attention of those men giving anesthetics exclusively an apt quotation from Emerson.

"Of course, he who has put forth his total strength in fit actions has the richest return of wisdom. I will not shut myself out of this globe of action, and transplant an oak into a flower-pot, there to hunger and pine; nor trust the revenue of some single faculty, and exhaust one vein of thought, much like those Savoyards, who, getting their livelihood by carving shepherds, shepherdnesses and smoking Dutchmen for all Europe, went out one day to the mountains to find stock, and discovered that they had whittled up the last of their pine trees."

55 GROTON BUILDING.

THE ANESTHETIST ON THE HOSPITAL STAFF.*

CHARLES H. SANFORD, M.D.
Attending Anesthetist, Lennox Hill Hospital,
NEW YORK CITY.

It seems both fitting and of interest, at a meeting of this character, to look back into history for a description of the first anesthetic and the method of producing narcosis for prolonged and extensive surgical procedure. We find this description in a textbook of surgery published in the Venetian Collection of Surgical Works, in the year 1497. The author, Theodoric, a bishop as well as a surgeon, gives the following description of the mode of obtaining anesthesia practiced by his father, Ugo of Lucca, or Hugh Borgognoni, who had been a surgeon to the crusaders about the year 1218:

"Having made a mixture of the wine extracts of opium, hemlock, mandragora, unripe mulberries and wild lettuce, a sponge should be boiled in this fluid until all is boiled away and then whenever anesthesia is wanted, this sponge should be placed in warm water for an hour and applied to the nostrils until the patient sleeps, when the surgical operation should be performed. At its end, another sponge dipped in vinegar should be frequently applied to the nostrils, or some of the juice of the root of hay should be injected into the nostrils, when the patient will soon awake."

*Read during the National Anesthesia Research Society Congress of Anesthetists, in Joint Meeting with the Interstate and New York Anesthetists, Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

We see here that, not only was anesthesia practiced, but also resuscitation attempted.

Again after the middle of the fourteenth century, we find a similar mode of anesthesia described by Guy de Chauliac, thus it would seem that anesthesia was both known and practiced to some extent during the years between.

During the centuries that followed, it would appear that the art of anesthesia was lost sight of, for we come down to the period of those great surgeons, Sir Astley Cooper and John Abernethy about the year 1787, which is spoken of as the pre-anesthetic and pre-antiseptic period.

We then come to America and in isolated regions we find working quietly and independently, such men as: Crawford Long, Wells, Jackson and others, until on October 16, 1846, Morton's public demonstration startled the world as though anesthesia had never been heard of. From that time on, anesthesia progressed by leaps and bounds.

BETTER ANESTHESIA AND BETTER SURGERY.

However, lacking in progressiveness may have been the past in anesthetic history, there can be no doubt of the present and the future growth of this important specialty; constructive mainly, destructive partly, in that old theories and methods have been discarded in favor of the newer and more scientific sequences. It is not necessary here, to mention each of the many scientific investigators, chemists, laboratory workers, inventors and anesthetists, who are devoting their entire time to the development of satisfactory analgesia and anesthesia to the end that the alleviation of pain be accomplished with the least amount of harm to the physical economy both immediate and remote.

Nor has this great progress in anesthesia been confined to the abolition of pain, for, hand in hand with this progress has gone the development of modern surgery: better anesthesia means better and more daring surgery and what this means to the human race, one need go no further than to consider the cancer problem wherein the most cachectic patient may require the longest operation and the greatest economy of physical reserve. In this field alone modern anesthesia has extended the limits of operation from two to seven hours with a gas-oxygen-ether sequence.

Great as has been the progress in both surgery and in anesthesia, each has gone its own way to a great degree. There are International, National, State, County and Local Surgical Societies; we have laid the foundation for the same in anesthesia, but, we rarely have a meeting of the two jointly; we lack sadly in cooperation. But, however remote may be joint surgical and anesthesia meetings, cooperation in the hospital is both desirable and necessary for the greater welfare of the patient.

ANESTHESIA HOSPITAL SERVICE.

The value of anesthesia has been recognized in many of our medical colleges by the creation of a Chair in Anesthesiology and making this subject a part of the curriculum. Many of our best hospitals have appointed attending anesthetists or visiting anesthetists. This is a step in the right direction, but, it should go further by creating an anesthesia service and recognizing the anesthetist as a member of the hospital staff with duties reaching beyond the operation room. The duties which devolve upon us as instructors are pretty well defined, but, in most instances stops with instruction in the various methods of inducing and maintaining anesthesia, the selection of the proper anesthetic and the use of the various forms of apparatus and the cardinal signs of the depth of anesthesia. Even here, the testing of the corneal and the conjunctival reflex is too often permitted; this is a precarious and unnecessary proceedure when observation of the movement and position of the eye-ball is all that is necessary regarding the eye.

Nursing Service.—Inasmuch as we too, are greatly concerned about the welfare of the patient after, as well as during the operation, our sphere of influence and help might well be extended to the teaching of the nurses who come in contact with surgical patients. Minor details, trivial in themselves, are persistently overlooked, yet their result may be far-reaching and disastrous to the patient. I have in mind the proper care of the patient during his preparation for operation, his transportation to the operation room, his care while waiting for the anesthesia to begin and again his careful wrapping in warm blankets after the operatoin. They should be taught the use of the various attachments to operating tables and their manipulation, the method of obtaining the various positions into which the patient may be placed for special operations, etc. All these details make for celerity and precision, thus saving the patient many valuable moments under the anesthetic.

Care of Apparatus.—It should be the duty of the attending anesthetist to make regular inspections of all the apparatus to see that these are kept in the highest degree of efficiency at all times; to supervise the careful sterilization of masks and inhalers between operations; to inspect the pulmotor or lung-motor regularly; to see that the hyperdermoclysis and intravenous sets are always in readiness for immediate use. In general, everything connected with

the anesthesia, resuscitation or stimulation might well be supervised by the anesthesia service.

Conferences.—In most A-1 hospitals, surgical conferences are held regularly by the attending surgeons and their assistants. The attending anesthetist might profitably be invited to these conferences and so enable him to keep in touch with the convalescence and progress of the cases discussed and note the effect of the anesthetic itself or criticize the method employed and note the influence generally of the anesthetic both during and after the operation. Thus cooperation between the surgeon and the anesthetist would lead to a better understanding of the difficulties of each and lead to conciliation where necessary, on the part of both. A patient need not always be under profound anesthesia if the surgeon will let us know a little in advance, when he is apt to require it, and will wait a moment if the patient does not immediately relax; it is just as easy for the anesthetist to *push* the anesthetic, but not for the patient to take it. It would also tend to correct the generally accepted idea that the anesthetist feels his responsibility ended with the completion of the operation, an idea which, if this assembly here to-day means anything at all, is quite erroneous and contrary to all our endeavors.

CONCLUSIONS.

In this short and concise paper, I have tried to show that the evolution of modern surgery is in no small way dependent upon the progress of present day scientific anesthesia. We have earned the right of recognition through our endeavors and results. I have pointed a way to improve the hospital service through supervision over the minor details usually only casually observed and I hope, for a closer and more sympathetic understanding between surgeon and anesthetist in their respective problems. If it shall awaken only a small amount of interest in these matters, it will have served its purpose.

1475 GRAND CONCOURSE.

YOU ARE CORDIALLY INVITED TO ATTEND THE THIRD ANNUAL MEETING OF THE CANADIAN SOCIETY OF ANESTHETISTS, WITH THE CANADIAN MEDICAL ASSOCIATION, AT THE MOUNT ROYAL HOTEL, MONTREAL. IF YOU HAVE A PAPER TO PRESENT GET IN TOUCH WITH DR. WESLEY BOURNE, 34 ST. MARK ST., MONTREAL, CANADA. YOUR MEMBERSHIP WILL ALSO BE APPRECIATED.

OXYGEN IN THE PERITONEAL CAVITY: WITH REPORT OF CASES.*

WM. SEAMAN BAINBRIDGE, Sc.D., M.D., C.M.,
NEW YORK CITY.

If it seems necessary to offer an explanation of a paper on the intra-abdominal use of oxygen, at this time, may I say that my attention was recently redirected to the subject by a number of physicians who spoke of this method of using the gas as *new* in surgery. Besides a reawakened interest in the subject, because of the clearer concept resulting from the use of oxygen in war surgery, there is an added interest in the comparatively new use of oxygen in connection with radiography.

Drs. Stewart and Stein, in a recent number of the *Journal of Roentgenology,* describe the methods and results of introducing oxygen in the abdominal cavity "to make visible a number of organs, tumors and abdominal areas which, heretofore, have been more or less inaccessible to the Roentgen ray examination. The liver, spleen and region of the gall bladder, pyloric end of the stomach, the wall of the stomach and large intestine with gas contents and the bladder filled with urine can all be distinctly outlined by gas inflation." The authors state "that the oxygen method is not a competitor of the opaque meal method, as the latter concerns the hollow organs, while oxygen inflation of the peritoneal cavity shows the solid structures, but, in conjunction, the two methods are ideal and, when the oxygen method has been perfected to a greater degree, the gas inflation for an obscure condition may save many patients exploratory laporatomies."

During the years 1908, 1909 and 1913, I published three articles on the intra-abdominal use of oxygen.† The first paper was written with the purpose of stimulating interest in the subject: reviewing the literature: reporting illustrative cases, and mapping out fields for further investigation. In this paper were reported experiments made upon animals with the purpose of discovering the beneficial effects, as well as the possible dangers, of the introduction of oxygen in the abdominal cavity. The tests were conducted to determine the absorbability of oxygen when injected into the abdominal cavity: the effect upon blood pressure, pulse, respiration, degree of anesthesia and the time of recovery after the anesthetic was discontinued: to determine the danger point of intra-adbominal pressure, as expressed by a

*Read during the Joint Meeting of the American and Mid-Western Associations of Anesthetists, Hotel Jefferson, St. Louis, Mo., May 22-24, 1922.

†Reported in part in the *N. Y. State Journal of Medicine,* June, 1908; *Annals of Surgery,* March, 1909; THE AMERICAN JOURNAL OF SURGERY, March, 1909, and the *American Journal of Obstetrics and Gynecology,* April, 1922.

fall in blood pressure, respiratory difficulty and cardiac failure and the effect of oxygen upon the formation or adhesions. Although I reported many of these experiments upon animals in my earlier paper, a brief resumé of the purpose and results of the experiments, in which I was assisted by Dr. Harold D. Meeker and James T. Gwathmey, may prove of interest at this time.

EXPERIMENTAL DATA.

In the *first series,* experiments to determine the absorbability of oxygen, when injected into the abdomen of a cat, the following technic was employed: a cat was anesthetized, the abdomen shaved, and a small incision made down to the peritoneum. A small trocar was introduced through this tissue at a sharp angle, while the peritoneum was lifted away from the intestines. The trocar was secured by a purse string suture of silk. The arrangement of the apparatus made it possible to determine the amount, the temperature and pressure of the oxygen used. The gas was introduced at a temperature of 38° C. Numbers of animals were distended with 200 cc. of oxygen at 60 mm. water pressure, others with 300 cc. at 100 mm. pressure, and still others with 400 cc. at 200 mm. pressure. After withdrawal of the trocar and closure of the wound, the cat was partly immersed in a jar of water to determine possible leakage. The animals were observed at frequnt intervals and apparent reduction in the size of the abdomen noted. When the abdominal girth approximated the normal, the cat was again anesthetized, the abdomen punctured under water, and any gas bubbles expressed were collected and measured.

Summary: The oxygen was completely absorbed in all cases left undisturbed thirty-six hours. In six of the cases no trace of the gas could be found after twenty-four hours, and in two none after eighteen hours. The increased intra-abdominal pressure had but little influence in hastening the process of absorption.

In the *second series* of experiments the effect of the intra-abdominal introduction was noted upon the following: (1) blood pressure, (2) pulse, (3) respiration, (4) degree of anesthesia, (5) time of recovery after the anesthetic was discontinued.

A cat was anesthetized, a carotid artery exposed, and connected in the usual manner with a mercurial manometer and kymograph. The oxygen was introduced into the abdomen in the manner already described. The following observations were made: (1) a slight increase in pulse rate. This was probably due to a certain amount of oxygen reaching the heart and stimulating the process which causes contraction of the heart muscle. (2) A slight increase in respiration, probably due to a stimulation of the respiratory center, dependent upon an increased production of carbon dioxid. (3) A slight rise in blood pressure which returned to normal in two or three minutes. The rise was due to pressure on the splanchnic vessels, thus assisting the venous flow to the right heart and obstructing the arterial flow. The return to normal was probably due to compensatory dilatation of the other vessels and to diminished diaphragmatic excursions which would cause a lessened amount of blood to flow from right to left heart through less distended lung tissue. (4) In all cases the immediate effect upon the degree of anesthesia was marked, the animal showing a tendency to come out from under the anesthetic almost immediately. In cases where the anesthetic was profound, reflexes became quickly active. (5) Animals into which oxygen had been introduced were able to stand in two to ten minutes after discontinuance of the anesthetic.

In the *third series* of experiments a number of cats were distended with air, the same technic, quantity and pressure of gas being used as in the oxygen experiments, the object being to effect a comparison with the second series of experiments with regard to the points in question. The effect on the pulse and respiratory rate was less marked, the blood pressure showed essentially the same result as in the second series. The influence of the introduction of air upon the degree of anesthesia was practically nil. The time of recovery from the anesthetic after it was discontinued was from fifteen to twenty minutes.

In the *fourth series* of experiments a number of animals were distended with oxygen under high pressure in order to determine the danger point of intra-abdominal pressure, as manifested by a full blood pressure, respiratory embarrassment and cardiac failure. The gas was introduced in the same manner as in the previous experiments, but the pressure measured by a mercurial manometer. The pressure was raised to the equivalent of 1,500 to 1,800 mm. of water, and in all cases the abdomen was exceedingly tense, so that it was scarcely possible to make any indentation with the finger tip. It was observed that the blood pressure rose steadily until the intra-abdominal pressure reached a point varying between 1,500 and 1,800 mm. of water, when it suddenly dropped. The heart action became more rapid and less regular and respiratory embarrassment primarily, and cardiac failure secondly, caused death in a short time. Autopsy revealed no microscopic damage to the viscera. The effect on the animal of the high intra-abdominal pressure demonstrated that the danger from the mechanical pressure of the gas may be

practically disregarded. There was but slight rise in blood pressure, and no marked respiratory or cardiac disturbance until the pressure became extreme, *i. e.*, reached a degree far in excess of that to which any human abdomen would likely to be subjected either by accident or intention. In any case the respiratory embarrassment would give warning of the approach of a danger point.

In the *fifth* series of experiments the object was to determine the effect of the intra-abdominal introduction of oxygen upon the formation of adhesions. Abdominal section was performed in a number of cats. In some the parietal and visceral peritoneum was sacrified, the abdomen moderately distended with 200 to 300 cc. of oxygen, according to the size of the animal, and the wound closed. In others the same operative procedure was performed, but no oxygen introduced into the abdomen. In still other animals, in order to make the approximation of the scarified surfaces a certainty, a portion of small intestine, three inches long was anchored to the transverse colon by two silk sutures. The approximated surfaces between the sutures were generously scarified, the abdominal cavity distended with oxygen, and the wound closed. This procedure was repeated on other animals and the wound closed without the introduction of oxygen. The animals used in this series were left for two and four days respectively. The contrast observed on autopsy between the cats in which oxygen had been used and those in which no gas had been injected was striking. Of the six treated with oxygen, two had a few fine adhesions close to the anchoring sutures, one had a few cobweb adhesions between approximated intestines, all other cases were free from adhestions of any sort. In every instance, however, where oxygen was not employed, abundant adhesions were found, both intra-visceral and parieto-visceral. The difference between the adhesions found on the animals autopsied on the second and those autopsied on the fourth day was one of density, rather than number.

The deductions would seem to be: (1) that the oxygen mechanically held the scarified surfaces apart until new cells were formed; (2) that the oxygen increased the activity of the individual cells, thus hastening a new growth of epithelium to replace the destroyed peritoneal cells, the denuded areas being thus covered over; (3) that the increased peristalsis caused by the oxygen was unfavorable to the production of adhesions.

In addition to the observations already recorded, a striking change in the color of the blood was noticed upon the introduction of oxygen into the abdominal cavity of cats intentionally put into a state of partial asphyxia. The dark blood quickly changed to scarlet. It was also observed that intestinal peristalsis was increased by the atmosphere of oxygen. In no case was there microscopic evidence that oxygen was an irritant to the peritoneum or any of the abdominal viscera.

DEDUCTIONS FROM EXPERIMENTAL DATA.

From the above experiments one may deduct the following: (1) Oxygen is completely absorbed in the abdominal cavity. (2) It is a slight respiratory stimulant. (3) It is a slight cardiac stimulant. (4) It has but little effect upon the blood pressure when the pressure of the gas is moderate. (5) It tends to bring an animal quickly from deep anesthesia. (6) It hastens the recovrey of an animal after discontinuance of the anesthesia. (7) A pressure of more than 1,500 mm. of water may cause collapse. (8) Oxygen tends to prevent the formation of adhesions. (9) It quickly changes a dark blood to scarlet in cases of anoxemia. (10) It stimulates the intestinal peristalsis. (11) It is not an irritant to the peritoneum or the abdominal viscera.

SURGICAL USE.

After many months of experimentation upon animals, I introduced oxygen into the peritoneal cavity, following laparotomies on patients. So far as I was able to learn at the time of publishing my earlier papers on oxygen, the gas had not been introduced and allowed to remain *in situ* until absorbed, previous to my own experiments in this line, although Thiriar and others had employed the gas in a continuous stream for flushing out the abdominal cavity after laparotomies and after evacuations of ascitic fluid in tuberculous peritonitis.

In more than two hundred and fifty laparotomies, I have used oxygen in the peritoneal cavity with uniformily favorable results. The method has been to balloon the abdomen with pure gas (94.3 to 97 per cent. oxygen) at a temperature of from 90° to 100° F., close the wound and allow the tissues to absorb the oxygen. In conditions of abdominal distension with ascitic fluid, in certain forms of tuberculous peritonitis, and in some cases where large tumors were removed, the gas was introduced to the point of distension caused by the tumor of fluid.

ILLUSTRATIVE CASE REPORTS.

The following cases are reported to illustrate the action of oxygen in the abdominal cavity:

Case 1.—C.V.—aged 39, married. This patient consulted me January 12, 1904. She was anemic, had intestinal indigestion, prolapsed and cystic ovaries and chronic appendicitis.

May 20, 1904, the right ovary, tube and appendix

were removed. Many tuberculous nodules were found, especially on the broad ligament and left ovary. Immediately following the abdominal introduction of oxygen, the blood became of brighter color, and the pulse and respiration distinctly improved. The oxygen was absorbed in thirty-six hours. The pathological report was: "Follicular ovarian cyst; acute miliary tuberculosis of the peritoneum covering the ovary and appendix."

September, 1921, the patient was reported well and strong and with no evidence of tuberculosis.

Case 2.—B. L.—aged 30, single, was admitted to the hospital suffering from diffuse tuberculous peritonitis, cystic ovaries and chronic appendicitis.

Operation was performed April 20, 1906, and included curettage, removal of the appendix, right ovary and portions of the left ovary. There was considerable cyanosis present, which disappeared upon the introduction of oxygen into the peritoneal cavity. The pulse immediately became stronger, respiration deeper and the patient's condition greatly improved. In forty-eight hours there was no evidence of the presence of the oxygen. The intra-abdominal administration of the gas unquestionably had a distinct tonic effect in this case. A letter from the patient, June, 1921, states that there has been no return of the tuberculous condition.

Case 3.—J. H.—aged 12, male, was operated on April 8, 1919. The boy was greatly emaciated. Marked tuberculous peritonitis and considerable fluid were found in the abdominal cavity. The small intestines were matted together with adhesions and were separated with great difficulty. When the adhesions were freed the intestines for more than four feet were denuded of all peritoneum, leaving a raw, bleeding surface. The appendix was removed and the abdomen distended with oxygen and closed.

September 12, 1921, the mother of the boy reported that the lad weighed 140 pounds, a gain of 35 pounds, and was absolutely well.

Case 4.—W. E.—aged 68, female. I was called in consultation, April 14, 1908, to see this patient, who was suffering with abdominal carcinosis and kinking of the intestine with obstruction. The case was so extreme that operative procedure was warrantable only upon the ground of attempting to control the vomiting which was persistent and almost fecal in character.

A large amount of fluid was removed from the abdomen and an attempt made to straighten the kinked gut. The patient was practically pulseless. The intra-abdominal administration of oxygen was followed by prompt improvement in pulse, respiration and general condition. Vomiting ceased, the patient rallied from shock and did as well as could be expected as long as the oxygen remained in the abdomen, but when the gas was all absorbed, she succumbed from asthenia four days after the operation. In this case the supporting effect of the oxygen was remarkable.

Case 5.—M. B.—aged 29, single, was operated on November 6, 1908, for fibroid tumors of the uterus, cystic ovaries, chronic appendix and tuberculous peritonitis. Following this operation, warm oxygen was introduced into the abdomen, and the wound was closed.

A second operation was performed July 18, 1912, for intestinal stasis. The small intestine, for about two feet from the junction with the large, was kinked at an acute angle, and fastened against the abdominal wall. After eliminating the kinks and suturing the intestine, a careful search was made for evidence of tuberculosis, of which not the slightest trace was found, not even the retroperitoneal glands being enlarged. The large intestine showed no ulceration, proving that the patient had been completely cured of the intestinal tuberculosis.

Case 6.—M. O.—aged 53, married. At operation, November 18, 1908, this patient's right ovary was found to be the seat of a very large cyst which had become adherent to the stomach and other viscera in the upper abdomen. There were multiple uterine fibromata. Panhysterectomy was performed, only the tip of the cervix being left. The entire mass weighed sixty-one pounds. Several pints of ascitic fiuid were evacuated from the peritoneal cavity. Shock was very great.

Oxygen was introduced until the abdomen was ballooned to very nearly its size previous to operation. The patient's condition immediately improved. During the entire time the oxygen remained in the abdomen, between thirteen and fourteen days, the face was somewhat flushed, the lips more than ordinarily moist and red. There was no nausea, no vomiting, and no paralysis of the intestine in spite of the previous intra-abdominal pressure. The patient's recovery was uneventful, and in 1920 she was alive and well.

Oxygen and Shock.

In surgical shock, blood transfusion, intravenous injection of gum arabic, oxygen inhalation and oxygen per enema are methods now in use. Air is occasionally employed to secure intra-abdominal pressure, but the pulse and respiration do not react as quickly under air as under pure oxygen. Saline solution introduced into the abdomen, and hypodermoclysis are both stimulants for respiration. However, the saline solution is very quickly absorbed and is but a temporary stimulant, often followed by a greater fall in blood pressure.

In the World War the subject of shock was very much to the fore and various theories as to its primary cause was advanced. Crile's deduction is that of adrenal and nerve exhaustion; Cannon's explanation is an accumulation and stagnation of blood in the capillaries, so that the blood is removed from currency; and Bayliss' theory is that a lack of adequate blood supply at the vital organs and nerve centers, are factors, doubtless, in the causation of surgical shock.

In the last analysis, however, shock is a multiplex condition and, among other causes, it seems evident that it may be produced by an engorgement of the

blood vessels, especially in the abdomen, either from the removal of a large tumor or the withdrawal of a considerable amount of fluid. Years ago, surgeons realized the importance of supporting the organs of the abdomen, the vessels, etc., after operations for abdominal tumors. McBurney, following severe laparotomies, strapped the abdomens of his patients with bath towels to keep, as he said, the blood from centering in this region. Of course, we know now, for obvious reasons that this procedure did not accomplish the desired result, but the idea had a very important and far reaching inference.

The introduction of oxygen in the peritoneal cavity, after the removal of a large tumor or a considerable amount of fluid, permits the abdominal viscera to resume their normal positions gradually. Without this oxygen pressure, or its equivalent, collapse of the organs usually follows the removal of the mass. The walls of the vessels are accustomed to the intra-abdominal pressure, and, when the support is removed, the walls become flabby and give way quickly. Any method which produces postoperative intra-abdominal pressure, lessens the engorgement, prevents dilation and a resulting tendency to paralysis of the vessels of the splanchnic viscera. Therefore, it would seem evident that when oxygen is introduced into the peritoneal cavity after operation, it is an agent of distinct value in *prevention* of shock or in the *treatment* of shock when such a condition exists.

OTHER USES.

Clinically, oxygen has been utilized in innumerable ways. As early as 1799, Beddoes employed oxygen for the cure of ulcers of a *mauvise* nature. In 1761, Mauiere and Gimbernat used injections of sterilized air in the treatment of hydrocele, and Marcane and Demarquay, in 1865, announced the cure by oxygen injection of a case of senile gangrene. Other authors cite the local use of the gas in furuncles, renal fistulas and psoas abscesses.

In an earlier paper, June, 1909, I reported cases of tuberculous ulceration of the intestine, tuberculous peritonitis and other infective processes cured by oxygen injection.

In cirrhosis of the liver, with ascites, where frequent withdrawal of the fluid was necessary, I found that the intra-abdominal introduction of oxygen often increased the length of the intervals between necessary tappings. The patient himself frequently mentioned the tonic effect of the oxygen. In flabby abdomens, where extensive operative manipulation had taken place, or where there had been abdominal pressure from a large tumor or considerable fluid, the introduction of the oxygen, with the mechanical supporting effect of the gas, seemed to act as a distinct factor in the prevention of ileus.

The beneficial influence of oxygen inhalation upon the digestive tract is fully recognized and its bactericidal and antiseptic properties are conceded. However from the results already secured, it is evident that there are still unrecognized therapeutic uses for the gas and a large field for further intensive research where the clinical and surgical possibilities of oxygen are to be considered.

34 GRAMERCY PARK.

GENERAL ANESTHESIA IN SUBMUCOUS AND OTHER NASAL OPERATIONS.*

J. G. POE, M.D.
Dallas, Texas.

Because of the excessive hemorrhage in submucus operations and turbinectomies, these opertaions are done by most operators under local anesthesia produced by packing the nose with cotton saturated with a solution of cocain to which adrenalin is also added; the latter to minimize the hemorrhage. This may be preceded by premedication 1-6 gr. morphin hypodermatically.

Some patients can be operated upon very well under local anesthesia, but a great majority of them suffer a great deal of pain and mental anguish that causes quite a shattered condition of their nervous systems for a week or more. There is, therefore, a great demand for provisions that will make for the safe and efficient use of general anesthesia in these cases.

I have been administering general anesthetics for these operations for the past three and a half years in Dr. Cary's clinic at Baylor Hospital, with such a degree of success that unless there is a special contraindication to general anesthesia, the general anesthetic bears the same relation to these operations that it does to laparotomies.

PREPARATION AND TECHNIC.

Our preparation of patient and technic is as follows:—

Patients enter the hospital the day before operation; are given a laxative at night, an enema, if needed, next morning, and no breakfast, (urinalysis. blood, and physical examination preceding), and thirty minutes before operation premedication of 1-6 morphin, 1-50 atropin are given hypodermatically. The anesthesia is induced by nitrous oxid-oxygen, then ether vapor is added to the above mentioned gases, and is continued to complete narcosis.

*Read During the Organization Meeting of the Southern Association of Anesthetists, Read House, Chattanooga, Tenn., November 14-16, 1922.

At this point the closed apparatus is changed to the semi-drop method. The surgeon then packs the nasal cavities with cotton saturated with adrenalin solution.

The head end of table is now elevated to 20 or 25 degrees, and induction of anesthesia is completed. The patient will now receive the ether vapor administered either by intraoral or intrapharyngeal insufflation without coughing, or other interruption of respiration.

The patient is maintained in a very *light stage* of anesthesia, with reflexes barely abolished, with either eccentrically fixed eye showing tension in recti muscles or globes being slowly moved from side to side, and shallow, slow, respiration. The surgeon now packs gauze through mouth in the naso-pharynx and removes the cotton from the field of operation and begins his work.

The elevation of patient's head, of course, lessens the congestion and hemmorhages and enables the light degree of anesthesia, proper in these operations, to be much more easily maintained and requires far less of the anesthetic agent. We have not had any shock or syncope in any of our cases.

THE THROAT TUBE.

The anesthesia is best maintained by intrapharyngeal insufflation of ether vapor delivered in the pharynx through an air way or throat tube, then with respiration through either mouth or the nose, the administration is not hindered in any way, and very little ether is required with this intrapharyngeal method.

I have devised a throat tube which is particularly adapted for intrapharyngeal insufflation of ether vapor. It has two tubes passing through the air way to its points and to one is attached the rubber tubing from the ether vaporizer, and to the other tube may be attached an aspirator, through which the throat may be cleared of blood, mucus, or debris, at any time.

This throat tube is also used in dental operations, especially extraction of teeth, by placing the tube in the opposite side of mouth and packing gauze back of teeth and against the tube to absorb the blood and also to catch teeth that otherwise might drop into the pharynx. It furnishes both an adequate airway and proper means of administering intrapharyngeal insufflation of ether vapor. In cleft palate operations the administration may be easily effected by means of a catheler passed through the nose to the pharynx, care being taken that respiration is free through the mouth, or vapor may fill the stomach. The intraoral insufflation method may be used but is not so satisfactory, as the lips may impede respiration, and if the patient breathes freely through the nose, anesthesia will not be maintained properly. The sterile covering of the patient is extended upward over the mouth after insertion of the air way and the anesthetist, with the right hand under the coverings, holds the patient's lower jaw firmly upward, the teeth against air way, giving free respiration and controlling movement of the head; and his left hand is left free to care for manipulation of the vaporizer.

The blood in these operations is kept out of operative field by aspiration. I have also devised the use of small metallic tubes that are just large enough to carry away the blood and yet small enough to not be in the way of the operator. The ordinary Eustachian tube catheter, bent to suit, fulfills the purpose admirably. Several should be prepared for each operation as they are easily clogged with blood.

After the operation is completed, if the nose is packed or obstructed in any way, the air way should remain in place until reflexes fully return and gagging necessitates its removal.

SUMMARY.

To summarize, the special requirements of the procedure are:—

1. Light anesthesia.
2. Induction completed after head is elevated.
3. Proper instruments for intrapharyngeal insufflation of ether vapor and means for easily regulating dosage or concentration of vapor.
4. Suitable aspirating apparatus for removing blood from the field of operation.
5. Competent care, when patient is returned to bed with nose obstructed by packing, that respiration through the mouth is provided.

BAYLOR HOSPITAL.

1923—MEETINGS—1923

Canadian Society of Anesthetists

Montreal, Canada, June 12-14, Mount Royal Hotel

American and Pacific Coast Anesthetists
Section on Anesthesiology

San Francisco, June 22-26, Hotel Stewart

Second Congress of Anesthetists
N. A. R. S., Interstate & Mid-Western & Chicago Anesthetists

Chicago, October 22-24, Auditorium Hotel

Southern Association of Anesthetists

Washington, D. C., November 12-14, Burlington Hotel

American Journal of Surgery

QUARTERLY SUPPLEMENT *of* ANESTHESIA *and* ANALGESIA

Surgery Publishing Co.

Established by J. MacDONALD, Jr., M.D.

15 EAST 26TH STREET - NEW YORK, U. S. A.

Original Articles, Clinical Reports and Experimental Researches on the Theory and Practice of Anesthesia and Analgesia, as well as pertinent Society Transactions, are solicited for exclusive publication in this Supplement. Typewritten Manuscripts facilitate Editorial Revision and avoid errors.

Subscribers Changing Address should immediately notify the publishers of their past and present locations.

Half-tones, Line-etchings and other Illustrations will be furnished by the Publishers when Photographs or Drawings are supplied by the Author.

F. HOEFFER MCMECHAN, A.M., M.D., *Editor*
Avon Lake, Ohio, U.S.A.

APRIL EDITORIALS 1923

WHAT SOME HOSPITALS ARE DOING.

Certain activities, within the profession and especially in the hospitals, have become prevalent recently, that are very destructive of the ethical standards of the practice of medicine, as well as demoralizing to the friendly relations that should be encouraged between patients and hospitals.

There is a tendency on the part of some hospitals to claim the patient as belonging to the hospital. The patient belongs to himself and his near and dear ones and is neither the property of the hospital nor the doctor. Certain hospitals would like to exercise this unwarranted proprietorship in order to commercially exploit the patient and the profession. The idea is to take possession of the patient at the front door, make a diagnosis by means of a flat-rate technical staff and then inform the patient what his hospital stay and treatment will cost him, collect the fees involved and pro-rate them among all concerned. This means a medical staff utterly dominated by the hospital management and serving at the mercy of the lay board of trustees.

The whole scheme involves commercial exploitation not only of the profession, nurses and specialists, but of patients as well. Nowhere is this better seen than in the relations of certain hospitals to anesthesia.

These hospitals, under the control of certain questionable leadership in hospital and medical associations, are using nursing anesthesia. To make this service pay a stupendous profit, these hospitals give their nurses a nominal salary for trying to give anesthetics, charge the patients the usual anesthesia fees for expert service and turn the balance into the treasury of the hospital.

In order to make this plan work it is necessary to close the doors of these hospitals to medical and dental anesthetists, because nursing anesthesia cannot be made to pay in competition with professional anesthesia. In consequence the Editor of the Supplement is advised on the best of authority that five medical hospitals in Cleveland alone bar all members of the medical and dental professions from giving anesthetics in their operating rooms, not only in charity but also in private cases.

The same situation of boycott and lockout obtains in the hospitals of other cities. This situation is bad enough from any viewpoint of ethics or decency. But there is another situation that is growing prevalent that is even worse. Some hospitals condescend to permit medical and dental anesthetists to enter their sacred precincts to give anesthetics in spite of the fact that they are commercially exploiting nursing anesthesia, but their method of making this pay a profit is to swat the patient with an extra fee for anesthetic service. The nurse who is exploited puts in an appearance in the operating room, in which the medical or dental anesthetists is giving the anesthetic, and inquires if she can be of service. Naturally, under the circumstances, her offer is declined, but the patient has to pay the professional anesthetist because he wants his life adequately safeguarded in one of its most crucial crises, and the hospital includes the anesthesia fee for nursing anesthesia in the hospital bill, although no service has been rendered, and the patient pays twice.

In some hospitals the rate for nursing anesthesia under this plan is as high as $25 an hour or fraction thereof, so it is apparent that these hospitals consider themselves privileged to charge patients on the basis of professional rates of fees, not only for actual nursing anesthesia, but also when no service at all has been rendered.

There is just one purpose behind such action and that is an effort on the part of such hospitals to make patients dissatisfied with professional anesthesia on account of the prohibitive double cost. The whole scheme involves a matter of obtaining money under false pretenses and it amounts to a form of petty larceny at the expense of the dangerously sick.

The deplorable feature of this situation is that some surgeons are participating in it to their eventual destruction. They have not enough vision to realize that hospitals indulging in these tactics are on the way to using the same methods on the surgeons themselves. Already there is an open movement within hospital associations to do without a medical and surgical house staff and turn this work over to nurses. In the near future certain surgeons will be told by their hospitals that the hospital will dictate their fee or salary, or they can get out. Some staffs are allowing themselves to be controlled by this threat.

The superintendent of one of the largest hospitals in Chicago returned from a 1922 hospital meeting and broached the matter of minor surgery by nurses to his staff. He was told that the moment he or the hospital board attempted to throw nurses into the

practice of surgery, the hospital would have to find an entirely new medical and surgical staff.

Doctors do not seem to realize just how dependent hospitals are on the medical profession and any staff has the solution of this problem right in its hands by telling patients frankly of the entire situation and also bringing it to the attention of the public through the press and business and commercial organizations and federations of women's clubs. Further nothing more than the mention of a resignation of the entire staff and a submission of the reasons to the county society is seldom needed.

A large number of right-minded, ethical surgeons are doing all they can in the premises by employing professional anesthetists, in spite of the attitude of the hospitals in forcing their patients to pay double fees for anesthesia, and it would seem that the organized profession should get behind these men and their anesthetists and enable them to make their hospitals reform and stop exploiting their patients.—McM.

Society Proceedings

JOINT MEETING OF THE AMERICAN AND PACIFIC COAST ANESTHETISTS WITH THE SECTION OF ANESTHESIOLOGY OF THE CALIFORNIA STATE MEDICAL SOCIETY.

Charles Schwab says that—"The fundamental requirements for a successful life are unimpeachable integrity, which is the foundation. Loyalty to those with whom you are associated. A liberal education in the finer things of life, art and literature as sources of imagination. The making of friends and laughing at misfortune. Learning to concentrate and not being afraid to make mistakes. The finding of yourself in your work. Giving the best that is in you and letting nothing stand in the way of your going on."

The Joint Meeting of the American and Pacific Coast Anesthetists with the Section on Anesthesiology of the California State Medical Society, at the Hotel Stewart, San Francisco, June 22-26, will enable all those interested in better anesthesia to advance in the specialty of their choice.

Aside from the usual Scientific Sessions devoted to exceptional papers on Research and Clinical Phases of Anesthesia, Clinics will be held on Saturday and Tuesday mornings of the meeting and if possible some Laboratory demonstrations will also be scheduled.

Membership in the several Associations is open to all licensed and qualified members of the medical and dental professions, as well as research workers holding doctorates of similar standing, who are interested in advancing the specialty of anesthesia. If you wish to present a paper during the meeting kindly notify one of the Secretaries at once, giving title and a brief abstract so that it may be properly placed on the program. Membership applications will be sent on request.

The following details of the scientific program may be announced at this time:

The Section on Anesthesiology of the California State Medical Association will meet on Friday afternoon, June 22, and some of the papers to be presented will be:—

The Anesthesia Situation in California (Chairman's Address).
Edgar I. Leavitt, San Francisco.

The Effects of Posture on Relaxation Under Anesthesia.
Caroline B. Palmer, San Francisco.

Reversing Anesthetic By-Effects Through Selective Medication.
Lorulli A. Rethwilm, San Francisco.

Some Considerations of Local Anesthesia.
Leo Eloesser, San Francisco

Spinal Anesthesia.
Phillip Cunnane, Los Angeles.

Spinal Anesthesia for Upper Abdominal Operations.
L. L. Stanley, San Quentin, Cal.

Sacral Anesthesia for Recto-Colonic Operations.
A. J. Murietta, Los Angeles.

Spinal Anesthesia in Obstetrics and Cesarean Section.
H. T. Cooke, Los Angeles.

On Friday evening there will be a Special Session on Anesthesia in Oral Surgery and Dentistry to which the local specialists and dentists will be invited. The following papers will be presented:—

Anesthesia for Oral Surgery with Special Reference to the Dangers and Advantages of the Beck-Mueller Apparatus.
Walter R. Crane, Los Angeles.

General Anesthesia in Nose and Throat Surgery Hypodermically Administered.
Isaac H. Jones, Los Angeles.

Pure Nitrous Oxid-Oxygen for Oral Surgery in the Upright Posture.
E. I. McKesson, Toledo, Ohio.

Handling the Problem of Difficult Cases Under Nitrous Oxid-Oxygen Anesthesia for Oral Surgery and Dentistry.
Leo Schuchard, San Francisco.

Selective Anesthesia for Plastic Surgery of the Mouth and Jaw.
Frank Chandler, Los Angeles.

Anesthesia Clinics will be held at Lane Hospital, Stanford University on Saturday morning, June 23, under the Chairmanship of Caroline B. Palmer.

It is expected that laboratory demonstrations of pertinent interest can be arranged for on Saturday afternoon, at the University of California Medical College.

A get-together social evening will be featured for the anesthetists and their ladies in attendance at the Hotel Stewart on Saturday evening.

There will be a General Session on Monday morning, June 25, with a presentation of the following papers:—

Address of Welcome.
S. T. Pope, San Francisco.

President's Address.
Eleanor Seymour, Los Angeles.

Keeping Anesthetic Records and What They Show.
John S. Lundy, Seattle, Wash.

Medico-Legal and Obstetrical Considerations of Scopoplamin Anesthesia.
R. E. House, Ferris, Texas.

Ethylene-Oxygen Anesthesia: Research and Clinical Considerations.
A. B. Luckhardt and Isabella C. Herb, Chicago.

The Monday afternoon Session will be devoted to a Symposium on Hazardous Risk Patients:—

The Anesthetist as a Consultant on the Surgical Team. (Chairman's Address.)
George P. Waller, Jr., Los Angeles.

Pre- and Postoperative Care of Patients from the Anesthetist's Viewpoint.
R. F. Hastreiter, Los Angeles.

Anemia in Relation to Surgery and Anesthesia.
W. H. Gilbert, Los Angeles.

Evaluation of Cardiac Reserve.
Alfred Friedlander, Cincinnati, O.

Heart Complications in Anesthesia.
J. M. Wilson, Pasadena, Calif.

Shock from the Anesthetist's Viewpoint.
Neil C. Trew, Los Angeles.

Anesthesia for Hazardous Brain Surgery Risks.
Dorothy A. Wood, San Francisco.

The Goiter Risk and a Simplified Technic of Local Anesthesia.
John Hunt, Seattle, Wash.

The Annual Dinner will be held at the Hotel Stewart on Monday evening, June 25, and will be enlivened with music and clever after-dinner speakers.

Anesthesia Clinics will be held at the University of California and Children's Hospitals on Tuesday morning under the Chairmanship of Mary E. Botsford.

The Tuesday afternoon Session will be devoted to a Symposium on Nitrous Oxid-oxygen Anesthesia and the following papers will be presented:—

Newer Concepts of Nitrous Oxid-Oxygen Anesthesia and its Clinical Possibilities. (Chairman's Address.)
E. I. McKesson, Toledo, Ohio.
Nitrous Oxid-Oxygen Anesthesia in Children.
Mary E. Botsford, San Francisco.
Nitrous Oxid-Oxygen Anesthesia from the Surgeon's Viewpoint.
Roland E. Skeel, Los Angeles.
Positive Pressure for Thoracic Surgery with Nitrous Oxid-Oxygen Anesthesia.
Sterling Bunnell, San Francisco.
Therapeutic Value of Oxids of Nitrogen.
W. H. Morse, Hartford, Conn.

Special railroad rates will be in effect and all the transcontinental lines will co-operate with you in planning for special routes and sightseeing trips so that your attendance at this meeting can be made a most enjoyable event. Make your reservations at the Hotel Stewart at once to avoid disappointment.

The Visiting Ladies will be especially entertained and details regarding the local social events and the Annual Dinner will be sent with the preliminary program.

The Officers and Committees of the several Associations will do everything they can to make the San Francisco meeting a memorable one and your attendance will amply repay you in every way.

For further information address

F. H. McMechan, M.D., Sec'y-Treas., American Anesthetists, Lake Shore Road, Avon Lake, Ohio.

Eleanor Seymour, M.D., Sec'y-Treas., Pacific Coast Anesthetists, 845 West 10th St., Los Angeles, Calif.

Lorruli A. Rethwilm, M.D., Sec'y-Treas., California Anesthetists, 2215 Webster St., San Francisco, Calif.

CANADIAN SOCIETY OF ANESTHETISTS—THIRD ANNUAL MEETING.

The Canadian Society of Anesthetists will hold its Third Annual Meeting at the Mount Royal Hotel, Montreal, Canada, June 12-14, in conjunction with the meeting of the Canadian Medical Association.

This meeting will not only afford the anesthetists of Canada a splendid opportunity of putting themselves in touch with current advances in their specialty, but it will also enable Eastern anesthetists, who will not go to San Francisco, to take part in the Montreal meeting and present papers. In the past Canadian Anesthetists have attended American meetings in force and it is hoped that American Anesthetists will return the compliment.

Among the papers for the Scientific Sessions, the following may be mentioned:

Address of Welcome.
D. Chipman, Montreal.
President's Address.
David H. Arnott, London, Canada.
Further Studies in the Pharmacological Effect of Impurities in Anesthetic Ethers.
Walter L. Mendenhall and A. W. Rowe, Boston.
Certain Experimental and Clinical Observations on Ether Anesthesia.
T. K. Kruse, Pittsburgh.
Observations Upon Some Reflex Effects of Ether.
M. S. Dooley.
Diabetic Coma in Relation to Surgery and Anesthesia.
F. G. Banting, Toronto.
The Theory vs. The Practice of Gas-Oxygen Anesthesia.
W. Easson Brown, Toronto.
The Anesthesia Problem in Exophthalmic Goiter.
Don. A. Warren, Hamilton.
Preliminary Medication.
Robert Hammond, White Plains, N. Y.
Psychology in its Relation to the Anesthetist.
John J. Buettner, Syracuse, N. Y.
Shock Prophylaxis.
Chas. J. Wells, Syracuse, N. Y.
Fatty Degeneration of the Liver Following Ether Anesthesia.
Wm. B. Howell, Montreal.
Effects of Ether Anesthesia on Afferent Paths in Decerebrate Animals.
A. Forbes and R. H. Miller, Boston.
Nitrous Oxid-Oxygen for Cystoscopy.
G. M. Geldert, Ottawa.
Newer Trends in Anesthesia.
F. H. McMechan, Avon Lake, O.
Carbon Dioxid Administration After Anesthesia.
James R. White, Boston.

Papers have also been promised from R. L. Stehle, H. G. Barbour and Wesley Bourne.

Anesthesia Clinics will be held in several of the Montreal Hospitals under the direction of Wm. B. Howell, Wesley Bourne and Charles LaRocque.

An innovation of interest will be a series of pertinent Laboratory Demonstrations to be given in the new McGill University Laboratory Building under the auspices of H. G. Barbour, R. L. Stehle, M. S. Dooley and Wesley Bourne.

Those who wish to present papers or give demonstrations during the meeting are urged to notify the Secretary at once. The Canadian Anesthetists are especially concerned in securing every anesthetist of Canada as a Fellow or Member and you are requested to suggest the names of those who are available for membership. The membership of American Anesthetists will also be appreciated.

The Visiting Ladies will be especially entertained and all those in attendance will be privileged to participate in the social functions of the Canadian Medical Association.

Mr. Cardy, who was the host of the Anesthetists at the Niagara Falls meeting, is now manager of the Mount Royal Hotel and will accord the Anesthetists every accommodation for their comfort and pleasure.

For further information address

WESLEY BOURNE, M.D., Secretary,
34 St. Mark St., Montreal, Canada.

NATIONAL ANESTHESIA RESEARCH SOCIETY CONGRESS OF ANESTHETISTS—JOINT MEETING WITH THE INTERSTATE AND NEW YORK ANESTHETISTS AND THE COLUMBUS DENTAL SOCIETY.

The National Anesthesia Research Society held its first Congress of Anesthetists, in Joint Meeting with the Interstate and New York Anesthetists and the Columbus Dental Society, at the Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

Samuel Johnston, Toronto, retiring President of the Interstate Anesthetists, presented the gavel to E. I. McKesson, Toledo, Ohio, who presided as President of the Congress. He in turn introduced the Honorary Chairmen who presided at the special sessions, Charles H. Sanford, New York City, for the New York Anesthetists, Arthur E. Guedel, Indianapolis, for the Interstate Anesthetists, Caroline B. Palmer, San Francisco, for the Pacific Coast Anesthetists, Wm. Webster, Winnipeg, for the Canadian Anesthetists and H. S. Shumway, Columbus, for the Columbus Dental Society.

The Congress was welcomed in a splendid address by F. L. Lawrence, one of the most noted Ohio surgeons.

The following scientific program was presented:

TEACHING OF ANESTHESIA.

General Considerations—Chairman's Address (Interstate Association of Anesthetists).
Arthur E. Guedel, M.D., Indianapolis.
Teaching the Pharmaco-Physio-Pathology of Anesthesia.
D. E. Jackson, M.D., University of Cincinnati Medical School.
The Teaching of Anesthesia at McGill University Medical School.
Wesley Bourne, M.D., Montreal, Canada.
The Teaching of Anesthesia to Dental Students at the Ohio State University Dental Department.
W. E. Martindale, D.D.S., Columbus, O.
Post-Graduate Instruction in Dental Anesthesia.
Theodore D. Casto, D.D.S., Temple University Dental School, Philadelphia, and
Henry I. Dorr, M.D., D.D.S., Winchester, Mass.

ANESTHESIA AND HOSPITAL SERVICE.

The Anesthetist on the Hospital Staff—Honorary Chairman's Address (New York Society of Anesthetists).
Charles H. Sanford, M.D., New York City.
Anesthesia Service at Lane Hospital, Stanford University Medical School—Honorary Chairman's Address (Pacific Coast Association of Anesthetists).
Caroline B. Palmer, M.D., San Francisco.
Anesthesia Service at the Toronto General Hospital.
Samuel Johnston, M. D., Toronto, Canada.

Anesthesia Service at the Jewish Hospital, Cincinnati—A Part-Time Specialty.
Moses Salzer, M.D., Cincinnati.

The Purity of Anesthetics and By-Effects of Impurities as Problems in Hospital Anesthesia Service.
Allan Winter Rowe, Ph.D., Boston Homeopathic Hospital.

Anesthesia Problem of the Large Municipal Hospital.
James Hartman, D.D.S., Cincinnati, O.

ANESTHESIA FOR ORAL SURGERY AND DENTISTRY

Further Studies in Better Nitrous Oxid-Oxygen Anesthesia—Maximum vs. Minimum Oxygenation.
George F. Seeman, D.D.S., Nashville, Tenn.

The Anesthesia and Surgical Problems of Alveolectomy.
F. F. Molt, D.D.S., Chicago.

The Anesthesia and Surgical Problems of Cleft Palate Surgery.
M. N. Federspiel, D.D.S., M.D., Milwaukee.

ANESTHESIA IN RELATION TO CARDIOLOGY

The Reaction of Certain Cardiac Conditions to Anesthesia and Surgery—President's Address (National Anesthesia Research Society).
E. I. McKesson, M.D., Toledo, O.

The Surgical Heart of the Child.
Maxwell Quackenbos, M.R.C.S., South Nyack, N. Y.

The Pre-Operative Evaluation of Cardiac Reserve.
James A. Heard, M.D., Pittsburgh.

The Disabled Heart and General Anesthesia.
N. Worth Brown, M.D., F.A.C.P., Toledo, O.

The Relation of the Autonomic Nervous System to Surgical Shock.
H. D. McIntyre, M.D., Marion, O.

Shock Prophylaxis.
Charles J. Wells, M.D., Syracuse, N. Y.

Oxygen-Carbon Dioxid Stimulation in Circulatory Depression.
J. R. McCurdy, M.D., Pittsburgh.

PRESSURE AND REBREATHING IN ANESTHESIA

The Value of Pressure and Controlled Rebreathing in Ether Anesthesia.
J. J. Vega, M.D., National Military Home, Dayton, O.

The Advantages of Pressure Anesthesia.
F. M. Caldwell, M.D., Pittsburgh.

GENERAL SESSIONS

The Anesthetist's Point of View—Honorary Chairman's Address (Canadian Society of Anesthetists).
Wm. Webster, M.D., D.S.O., Winnipeg, Canada.

The Advantages of the Sitting Posture and Nitrous Oxid-Oxygen Anesthesia in Brain Surgery.
H. H. Heath, M.D., Toledo, O.

Anesthesia in Prostatics.
Everett A. Tyler, M.D., Philadelphia.

Misconceptions of Nitrous Oxid-Oxygen Anesthesia.
A. E. Peebles, D.D.S., Wilmington, O.

Direct, External Tracheal Insufflation: Report of Cases—Honorary Chairman's Address (Southern Association of Anesthetists).
Wm. Hamilton Long, M.D., Louisville, Ky.

Somnoform Anesthesia.
Don A. Crawford, D.D.S., Cleveland, O.

Nitrous Oxid-Oxygen-Ether Administration for Dental Anesthesia.
H. Howard Powers, D.D.S., Bay City, Mich.

Nitrous Oxid-Oxygen Anesthesia without Ether for Tonsillectomy in the Dorsal Posture.
John H. Evans, M.D., Buffalo, N. Y.

The Scope and Utility of Cotton Process Ether Anesthesia in Various Operations.
C. C. McLean, M.D., Dayton, O.

Anesthesia in the Aged: Case Reports.
W. I. Jones, D.D.S., Columbus, O.

"Lafayette Plan" Draping for Thyroid Surgery: A New Goiter Mask and Modified Gas-Oxygen Apparatus: Preliminary Report on Somnoform as a Synergist.
Floyd T. Romberger, M.D., Lafayette, Ind.

Clinics were held at McKinley and other hospitals on Tuesday morning of the Congress. Among the notable demonstrations was that of the team work of Ira O. Denman and E. I. McKesson, Toledo, O., in tonsillectomy in the forward inclined sitting posture under nitrous oxid-oxygen. C. C. McLean, Dayton, O., demonstrated his method of preoperative examination and safety-first guides during anesthesia under Cotton Process ether.

The Annual Dinner was held on Tuesday evening and was a most enjoyable affair.

During the Executive Session of the Interstate Anesthetists the minutes of the previous meeting and the Treasurer's report were accepted as read. The following were elected to membership: L. L. Aultz, Charleston, W. Va.; M. L. Axeliod, Cleveland, O.; A. E. Beckert, Canton, O.; G. E. Beckman, Jacksonville, Fla.; Grace M. Boswell, Cincinnati, O.; J. B. Bogan, Washington, D. C.; H. O. Cobb, Perry, Iowa; Eliza F. Cottis, Jamestown, N. Y.; F. Y. Donn, Washington, D. C.; D. F. Downing, Orange, N. J.; F. E. Duehring, Washington, D. C.; Katherine Gerow, Detroit, Mich.; I. H. Goldman, Richmond, Va.; A. C. Gray, Washington, D. C.; E. L. LeMerle, Washington, D. C.; T. I. Lowe, Washington, D. C.; J. T. Mann, Washington, D. C.; W. C. Maxwell, Pittsburgh, Pa.; J. B. Mulholland, Buffalo, N. Y.; Edgar Rae, Toronto, Canada; Mary N. Sloan, Buffalo, N. Y.; G. H. Rawson, Washington, D. C., and J. J. Vega, Dayton, O.

Because of his years of effort in establishing anesthesia as a specialty in dentistry and also on account of his munificent gifts in behalf of the teaching of anesthesia, Henry I. Dorr, Winchester, Mass., was unanimously elected to honorary membership.

The following officers were elected for the ensuing year: W. T. Shannon, Detroit, Chairman; C. C. McLean, Dayton, O., Vice-Chairman; F. H. McMechan, Avon Lake, O., Secretary-Treasurer; Robt. B. Hammond, White Plains, N. Y., H. M. Fisher, St. Louis, J. A. Heidbrink, Minneapolis, Mary Lyons, Chicago, Lincoln F. Sise, Boston and Samuel E. Sawyer, Lewiston, Maine, Executive Committee.

The usual appropriation was voted the Secretary for his services during the year.

Those present were so enthused by the splendid address of Prof. D. E. Jackson that a class under the auspices of the N. A. R. S. was organized at the suggestion of E. I. McKesson to spend the week of January 8, in the Pharmacological Laboratory of the University of Cincinnati Medical College.

The success of the Congress was materially aided by the large number of manufacturers who exhibited their pertinent products and apparatus.

In point of attendance, quality of papers, interesting discussion and development of newer ideas, the Congress was one of the most successful meetings of anesthetists ever held. Those present were unanimous in requesting that another be undertaken.

To meet this request the National Anesthesia Research Society will hold a Second Congress of Anesthetists in Joint Meeting with the Interstate and Mid-Western Anesthetists, at the Auditorium Hotel, Chicago, October 22-24, during the Clinical Congress of Surgeons. All anesthetists are cordially invited to attend.

THE SOUTHERN ASSOCIATION OF ANESTHETISTS—ORGANIZATION MEETING.

The Anesthetists of the South met in organization session at the Read House, Chattanooga, Tenn., November 14-15, 1922, during the meeting of the Southern Medical Association, and were called to order by the Honorary Chairman, F. H. McMechan, General Secretary, Associated Anesthetists, Avon Lake, Ohio, who presented the gavel to the Organization Chairman, Ansel M. Caine, New Orleans, La.

Edward T. Newell, Chattanooga, Tenn., delivered a brief address of welcome, which was responded to on behalf of the Anesthetists by the Honorary Chairman.

W. Hamilton Long, Organization Secretary-Treasurer, reported the progress made in organization. It was decided to make permanent this temporary organization and a constitution and by-laws were adopted. The name of the organization to be the "Southern Association of Anesthetists" and to meet annually. Provision was made for active, associate and honorary members. The active members must live and practice in the Southern states proper, the associate are those who live without the territory of the Association, and the honorary those whose work in anesthesia has been especially outstanding and distinctive. The only honorary member elected was F. H. McMechan.

The following organization officers were elected for the ensuing year: President, Ansel M. Caine, New Orleans, La.; First Vice-President, Olin W. Rogers, Knoxville, Tenn.; Second Vice-President, Nettie Klein, Texarkana, Tex.; Secretary-Treasurer, W. Hamilton Long, Louisville, Ky.

The following were named as the Executive Committee: I. W. Cooper, Meridian, Miss.; Thos. J. Collier, Atlanta, Ga.; A. R. Beyer, Tampa, Fla.; Harry Harrison, Norfolk, Va., and P. N. Ogle, Knoxville, Tenn.

The two following resolutions were presented and unanimously approved by the Association:

Whereas, The Southern Medical Association has taken steps toward securing proper recognition of the pioneer work in anesthesia of Crawford W. Long, definitely proven to have been the first to perform an operation under ether anesthesia; therefore, be it

Resolved, That the Southern Association of Anesthetists, now duly and permanently organized, does hereby offer its hearty co-operation and support to the Southern Medical Association in this worthy effort to put Crawford W. Long's name among those of the truly great benefactors of mankind.

Whereas, The Southern Association of Anesthetists, now duly and permanently organized and pledged to the advancement of scientific anesthesia in the South, has received in its organization work the hearty support and assistance of the Southern Medical Association, proffered through that organization's Secretary-Manager and official representative; therefore, be it

Resolved, That the Southern Association of Anesthetists hereby extends its appreciation to the Southern Medical Association for this assistance and co-operation and looks forward to a continuation of this co-operation at future meetings.

A facsimile of the memorial tablet to Crawford W. Long in the Medical Department of the University of Pennsylvania is to be used as the emblem of the Association for their official stationery.

The meeting throughout was marked by much enthusiasm and interest which was encouraging to those responsible for launching the organization. The Association starts with a charter membership of more than sixty.

The following papers were read in the scientific program:

The Problem of Service in the Relation of the Professional Anesthetist to the Surgeon (Chairman's Address), Ansel M. Caine, New Orleans, La.

The Technic of Insufflation Anesthesia and Position and Preparation of Patients in Nasal and Oral Operations, J. G. Poe, Dallas, Tex.

Hypotension in Relation to Surgical Conditions and Operative Risks, Stewart R. Roberts, Atlanta, Ga.

The "Safety-First" Campaign of the Associated Anesthetists. The Breath-Holding Test and Its Practical Value in Predetermination of the Surgical Risk (lantern slides), F. H. McMechan, Avon Lake, O.

Synergistic Analgesia, F. D. Smythe, Memphis, Tenn.

The Anesthetists on the Hospital Staff, D.Y. Keith, Louisville, Ky.

A Consideration of Nitrous Oxid-Oxygen in Obstetrics, E. I. McKesson, Toledo, Ohio.

New Ethers and Their Application, Ben Morgan, Chicago, Ill.

The Southern Association of Anesthetists will hold its second annual meeting in Washington, D. C., at the Burlington Hotel, November 12-14, 1923, conjointly with the Southern Medical Association. Those interested in membership or in presenting papers are requested to get in touch with the secretary, Wm. Hamilton Long, M.D., 1911 Duker St., Louisville, Ky.

Quarterly Index

ACIDOSIS IN HYPERTHYROIDISM. R. H. Major, Kansas City, Kansas. Journal American Medical Association, January 13, 1923.

ALKALOSIS AND TETANY, THE ALLEGED RELATION BETWEEN. Editorial. American Medical Association Journal, December 30, 1922.

ANESTHESIA, CURRENTS IN THE PROGRESS OF. David E. Hoag, Pueblo, Col. American Journal of Surgery, Anesthesia Supplement, January, 1923.

ANESTHESIA, CHOOSING FOR GENERAL SURGERY. J. M. Hayes, Minneapolis. Minnesota Medicine, January, 1923.

ANESTHESIA, PREFERABLE METHOD FOR. Hinterstoisser. Zentralblatt für Chirurgie, October 7, 1922.

ANESTHESIA AND INSTRUMENTATION IN TONSILLECTOMIES. Birkholz. Medizinische Klinik, November 5, 1922.

ANESTHESIA IN INTRACRANIAL SURGERY. Z. Mennell. Proceedings Royal Society of Medicine, Section on Anesthesia, 1922.

ANESTHETIC VAPOR, DIFFERENT EFFECTS PRODUCED BY EXPOSING TISSUES TO VARIOUS CONCENTRATIONS OF. A. L. Fleming. British Medical Journal, November 11, 1922.

ANESTHETICS, EFFECTS OF ON THE LUNGS. R. J. S. McDowell. British Medical Journal, January 13, 1923.

ANESTHETIC GENERAL, ABILITY OF ALKALINE SOLUTION TO INFLUENCE AMOUNT OF STAINABLE LIPOID MATERIAL THAT APPEARS IN THE KIDNEY OF NATURALLY NEPHROPATHIC ANIMALS FOLLOWING USE OF. William deB. MacNider, Chapel Hill, N. C. Journal of Pharmacology and Experimental Therapeutics, December, 1922.

ANESTHETIC, CHOICE OF IN MAJOR UROLOGIC SURGERY. W. H. Thomas, Philadelphia. New York Medical Journal and Medical Record, November 1, 1922.

ANESTHETIST, RELATION OF SURGEON TO. S. T. Pope, San Francisco. California State Journal of Medicine, November, 1922.

APPARATUS—A NEW ETHER DROPPER. Lyman G. Barton, Plattsburg, N. Y. American Journal of Surgery, Anesthesia Supplement, January, 1923.

APPARATUS—AN OXYHEMOGLOBINOMETER FOR THE CLINICAL MEASUREMENT OF CYANOSIS. P. J. Flagg, New York City. Proceedings of the Society for Experimental Biology in Medicine, 1922, Vol. 19.

APPARATUS—SUPPORT FOR OPERATIONS ON THE KIDNEY. M. Seres. Revista Espanola de Medicina y Cirugia, August, 1922.

BLOOD CHEMISTRY IN SURGERY, PROGNOSTIC VALUE OF. J. C. Bauer and R. W. Stoneburner, Montgomery. West Virginia Medical Journal, January, 1923.

BLOOD CRISIS AFTER LIGATURE OF AN EXTREMITY. J. Le Calve. Bulletin de l'Academie de Medicine, December 5, 1922.

BLOOD PRESSURE, HIGH, PRESENT VIEWS REGARDING. F. C. Askenstedt, Louisville. Kentucky Medical Journal, December, 1922.

BLOOD PRESSURE DURING OPERATIONS. A. Leahrnbecher. Beiträge für klinische Chirurgie, 1922, Vol. 127, No. 2.

BLOOD, SUGAR CONTENT OF DURING ANESTHESIA. H. Dewes. Archive für klinische Chirurgie, November 30, 1922.

BLOOD VOLUME, STUDIES IN. R. Gesell, C. S. Capp, F. Foote, Berkeley, Calif. American Journal of Physiology, December, 1922.

CARDIO-RESPIRATORY REFLEX, A NEW. Aschner. Medical World, January, 1923.

CHLOROFORM POISONING, METABOLISM IN. F. P. Underhill and R. Kapsinow, New Haven, Conn. Journal of Metabolic Research, July, 1922.

CIRCULATORY DISTURBANCES — ELECTROCARDIOGRAMS AND HEART MUSCLE DISEASE. H. E. Pardee and A. M. Master, New York City. Journal American Medical Association, January 13, 1923.

DEATH AT THE DENTAL HOSPITAL UNDER GENERAL ANESTHESIA. Australian Journal of Dentistry, October, 1922.

ETHER-OIL COLONIC ANESTHESIA BY CONTROL METHOD. A. E. Boyd. Irish Journal of Medical Science, December, 1922.

ETHER IN THE TROPICS: PINSON'S APPARATUS. A. Hootan. Indian Medical Gazette, December, 1922.

ETHER THERAPY FOR HICCOUGH. C. L. Gibson, New York City, Journal American Medical Association, February 10, 1923.

ETHER THERAPY TO COMBAT ATONIC HEMORRHAGES IN CESAREAN SECTION. Sikwart. Zentralblatt für Gynakologie, November 18, 1922.

ETHYL CHLORID ANESTHESIA IN MINOR OPERATIONS. Louise O. Oldenbourg, Berkeley. California State Journal of Medicine, November, 1922.

GLUCOSE SOLUTIONS, STRONG, AS PREVENTIVE OF OPERATIVE AND ANESTHESIA MISHAPS. B. Henckhoff. Zentralblatt für Chirurgie, October 7, 1922.

GLUCOSE AND SALT INFUSIONS OF ISOTONIC SOLUTIONS. E. Zagari. Riforma Medica, December 11, 1922.

HISTORICAL—CRAWFORD W. LONG, DISCOVERER OF ANESTHESIA. F. K. Boland, Atlanta. Southern Medical Journal, November, 1922.

LOCAL ANESTHESIA—SURGERY OF THE UPPER ABDOMEN UNDER LOCAL ANESTHESIA. R. E. Farr, Minneapolis. Illinois Medical Journal, February, 1923.

LOCAL ANESTHESIA FOR ANO-RECTAL OPERATIONS. A. J. Grant, London. Canadian Medical Association Journal, November, 1922.

LOCAL ANESTHESIA IN RECTO-COLONIC OPERATIONS. Samuel G. Gant, New York City. Medical Brief, January, 1923.

LOCAL ANESTHESIA, ASEPTIC AS APPLIED TO ANAL REGION, WITH ESPECIAL REFERENCE TO ANESTHETIC COMPOSITION. E. G. Martin, Detroit. New York Medical Journal and Medical Record, January 17, 1923.

LOCAL ANESTHESIA—APOTHESIN. W. M. Folks, Waycross, Georgia Medical Association Journal, November, 1922.

LOCAL ANESTHESIA—VALUE OF BUTYN AS A LOCAL ANESTHETIC. W. M. Beaumont. British Medical Journal, January 13, 1923; and British Journal Dental Science, February, 1923.

LOCAL ANESTHESIA, CESARIAN SECTION UNDER. E. C. Roos, Decatur. Illinois Medical Journal, January, 1923.

LOCAL ANESTHESIA—CESAREAN SECTION IN PRESENCE OF DOUBLE PNEUMONIA. W. C. Seelye, Worcester, Mass. Boston Medical and Surgical Journal, January 4, 1923.

LOCAL ANESTHESIA, CESAREAN SECTION UNDER. Waldstein. Wiener klinische Wochenschrift, October 19, 1922.

LOCAL ANESTHESIA—ALVEOLAR PROCESS RESECTION. Carl D. Lucas, Indianapolis. Current Researches in Anesthesia and Analgesia, December, 1922.

LOCAL ANESTHESIA—COCAIN AS AN ANESTHETIC IN THE URETHRA AND BLADDER. Society Transactions. Urologic and Cutaneous Review, January, 1923.

LOCAL ANESTHESIA—CONDUCTION ANESTHESIA APPLIED TO THE LEG... L. Druner. Zentralblatt für Chirurgie, September 2, 1922.

LOCAL ANESTHESIA—METHOD OF LOCATING AND BLOCKING THE CUTANEOUS COLLI NERVE. J. B. McNerthney, Tacoma, Wash. Surgery, Gynecology and Obstetrics, November, 1922.

LOCAL ANESTHESIA—EXPERIMENTAL OBSERVATIONS ON LOCALIZATION OF PAIN SENSE IN PARIETAL AND DIAPHRAGMATIC PERITONEUM. J. A. Capps and G. H. Coleman, Chicago. Archives of Internal Medicine, December, 1922.

LOCAL ANESTHESIA—LIMITATIONS AND TECHNIC OF LOCAL ANESTHESIA IN RECTO-COLONIC OPERATIONS. S. G. Gant, New York City. Ohio State Medical Journal, November and December, 1922.

LOCAL ANESTHESIA, OBSERVATIONS ON. J. E. Boyd, Jacksonville. Florida Medical Association Journal, September, 1922.

LOCAL ANESTHESIA—PARAVETEBRAL ANESTHESIA IN ABDOMINAL SURGERY. N. H. Lowry, Chicago. Illinois Medical Journal, December, 1922.

LOCAL ANESTHESIA, THE PLACE OF IN THE ANESTHESIA PROBLEM. A. L. Blesh, Oklahoma City. American Physician, January, 1923.

LOCAL ANESTHESIA—PTERYGO-MANDIBULAR ANESTHESIA. Mendel Nevin, Brooklyn. Dental Items of Interest, November, December, 1922; and January, February, 1923.

LOCAL ANESTHESIA—PROCAIN DERMATITIS AMONG DENTISTS. H. K. Gaskill, Philadelphia. Archives of Dermatology, November, 1922.

LOCAL ANESTHESIA—REGIONAL ANESTHESIA. Southgate Leigh and J. H. Culpepper, Norfolk, Va. Virginia Medical Monthly, January, 1923.

LOCAL ANESTHESIA—REGIONAL ANESTHESIA OF THE NECK AND ARM. Brunin and Vandeput. Archives Franco-Belges de Chirurgie, August, 1922.

LOCAL ANESTHESIA—TRANSSACRAL NERVE BLOCK ANESTHESIA IN SURGERY OF THE PELVIC FLOOR AND VISCERA. W. R. Meeker and E. B. Frazer, Rochester, Minn. Surgery, Gynecology and Obstetrics, December, 1922.

LOCAL ANESTHESIA—THE PRESENT STATUS OF LOCAL AND SACRAL ANESTHESIA IN ANO-RECTAL DISEASES. Louis J. Hirschman, Detroit. Current Researches in Anesthesia and Analgesia, December, 1922.

LOCAL ANESTHESIA—BLOCKING THE SPLANCHNIC NERVES. B. Quarella. Policlinico, November 15, 1922.

LOCAL ANESTHESIA—BLOCKING THE SPLANCHNIC NERVES FOR ABDOMINAL SURGERY. R. Gandusio and G. Pototschnig. Archivio Italiano di Chirurgia, November, 1922.

LOCAL ANESTHESIA—LUMBAR ANESTHESIA. Seyffardt. Münchener medizinische Wochenschrift, November 24, 1922.

LOCAL ANESTHESIA—SPINAL ANESTHESIA FROM A STUDY OF FIFTEEN THOUSAND INDUCTIONS. W. Wayne Babcock, Philadelphia. Pennsylvania Medical Journal, February, 1923.

LOCAL AND SPINAL ANESTHESIA IN CHILDREN. H. L. Rocher. Archives de Medicine des Enfants, December, 1922.

LOCAL ANESTHESIA—RISKS OF SPINAL ANESTHESIA FROM THE CLINICAL AND MEDICO-LEGAL STANDPOINTS. M. Gioseffi. Riforma Medical, October 9, 1922.

LOCAL ANESTHESIA—SPINAL ANESTHESIA OR ANALGESIA. B. H. Wagnon, Atlanta. Georgia Medical Association Journal, November, 1922.

LOCAL ANESTHESIA—INTRASPINAL ANESTHESIA. E. Matons. Semana Medica, August 3, 1922.

LOCAL ANESTHESIA—EXPERIENCES WITH INTRASPINAL ANESTHESIA. G. J. Devincenzi. Anales de la Facultad de Medicina Montevideo, June-July, 1922.

LOCAL ANESTHESIA—HIGH INTRASPINAL ANESTHESIA. T. Jonnesco. Presse Medicale, October 28, 1922.

MEDICO-LEGAL—THE ADMINISTRATION OF GENERAL ANESTHETICS BY DENTISTS. Australian Journal of Dentistry, October, 1922.

MEDICO-LEGAL POSITION OF THE ANESTHETIST. J. D. Mortimer, London. Medical Brief, February, 1923.

METABOLIC RATES, BASAL, A STUDY OF IN FATIGUE STATES. Roland Cummings, Los Angeles. California State Journal of Medicine, February, 1923.

NARCOTICS, ACTION OF ON MEDULLA AND CHEMICAL CHANGES OF BLOOD. W. J. R. Heinekamp, H. V. Atkinson and H. N. Ets, Chicago. Journal of Laboratory and Clinical Medicine, December, 1922.

NITROUS OXID. Wesley Bourne, Montreal. Canadian Medical Association Journal, January, 1923.

NITROUS OXID-OXYGEN ANESTHESIA IN MAJOR SURGERY. A. W. Blaine, Detroit. Journal Michigan State Medical Society, November, 1922.

NITROUS OXID-OXYGEN ANESTHESIA, THE INDUCTION OF. J. A. Heidbrink, Minneapolis. Current Researches in Anesthesia and Analgesia, December, 1922.

NITROUS OXID-OXYGEN ANESTHESIA FOR OPEN MOUTH WORK BY SECONDARY SATURATION, THE MANAGEMENT OF PATIENTS UNDER. B. H. Harms, Omaha. Current Researches in Anesthesia and Analgesia, December, 1922.

NITROUS OXID, THE PHYSIOLOGICAL EFFECTS OF. Neil C. Trew, Los Angeles. California State Journal of Medicine, February, 1923.

NITROUS OXID IN OBSTETRICS, REMARKS ON THE TECHNIC OF. A. E. Guedel, Indianapolis. Indianapolis Medical Journal, December, 1922.

NOURISHMENT DURING OPERATIONS. P. Bastianelli. Archivio Italiano, di Chirurgia, November, 1922.

OBSTETRICS—AMNESIA AND ANALGESIA IN LABOR. F. Gross, Kansas City, Kansas. American Journal of Clinical Medicine, December, 1922.

OBSTETRIC ANALGESIA. R. C. Coburn, New York City. New York State Journal of Medicine, November, 1922.

OBSTETRICAL ANALGESIA. J. V. D. Young, New York City. New York State Journal of Medicine, November, 1922.

OBSTETRICAL ANESTHESIA—ANESTHETIZATION OF PATIENT FOR CLASSICAL CESAREAN SECTION. H. R. Spencer. British Medical Journal, November 11, 1922.

OBSTETRICAL — SCOPOLAMIN-MORPHIN SEMI-NARCOSIS IN THE SECOND THOUSAND DELIVERIES IN BARNES HOSPITAL. O. S. Krebs and L. R. Wilson, St. Louis. Journal Missouri Medical Association, January, 1923.

OXYGEN DURING ANESTHESIA, IMMEDIATE AND REMOTE ILL-EFFECTS OF INSUFFICIENT. Eugene Cary, Chicago. American Journal of Surgery, Anesthesia Supplement, January, 1923.

OXYGEN SUPPLY AND DEMAND IN GENERAL ANESTHESIA. R. C. Whitehead, Norfolk, Va. Virginia Medical Monthly, December, 1922.

OXYGEN, SCOPE AND UTILITY OF THE THERAPEUTIC ADMINISTRATION OF. Alvin L. Barach, New York City. American Journal of Surgery, Anesthesia Supplement, January, 1923.

OXYGEN, UTILIZATION OF IN BLOOD AT DIFFERENT STAGES OF ANOXEMIA. C. H. and C. W. Greene, Columbia, Mo. American Journal of Physiology, November, 1922.

PAIN, INFLUENCE OF, AND ITS ALLIES UPON THE CEREBRAL CORTEX CELLS. G. S. Foster, Manchester, N. H. American Physician, February, 1923.

PITUITRIN IN ABDOMINAL SURGERY. J. C. Pate, Macon. Georgia Medical Association Journal, November, 1922.

PREOPERATIVE COMPLICATIONS—THE BREATHING OF NEPHRITICS. Beaumont Cornell, Brockville, Canada. American Journal of Surgery, Anesthesia Supplement, January, 1923.

PREOPERATIVE COMPLICATIONS — CONTRAINDICATIONS FOR LOCAL AND GENERAL ANESTHETICS. W. S. Newton. Australian Journal of Dentistry, November, 1922.

PREOPERATIVE COMPLICATIONS—EPINEPHRIN IN THE STOKES-ADAMS SYNDROME. H. Feil, Cleveland. Journal American Medical Association, January 6, 1923.

PREOPERATIVE COMPLICATIONS—SOME CASES OF USUAL INTEREST TO THE ANESTHETIST. W. B. Howell, Montreal. Current Researches in Anesthesia and Analgesia, December, 1922.

PREOPERATIVE COMPLICATIONS—MYOCARDIAL INSUFFICIENCY. R. K. Barry, San Diego. California State Journal of Medicine, October, 1922.

PREOPERATIVE COMPLICATIONS—SURGERY IN PATIENTS WITH OBSTRUCTIVE JAUNDICE. Waltman Walters, Rochester, Minn. American Journal of Surgery, Anesthesia Supplement, January, 1923.

PREOPERATIVE COMPLICATIONS—THE FACTOR OF OBESITY IN SURGICAL OPERATIONS. W. C. G. Kirchner, St. Louis. Journal Missouri State Medical Association, February, 1923.

PREOPERATIVE COMPLICATIONS—PREOPERATIVE PREPARATION OF PATIENT WITH OBSTRUCTIVE JAUNDICE AND END RESULTS IN 34 CASES. Waltman Walters, Rochester. Minnesota Medicine, January, 1923.

PREOPERATIVE COMPLICATIONS—RENAL AND HEPATIC INSUFFICIENCY IN OBSTRUCTIVE JAUNDICE. Waltman Walters and Duncan Parham, Rochester, Minn. Surgery, Gynecology and Obstetrics, November, 1922.

PREOPERATIVE COMPLICATIONS—SURGERY FOR THE TUBERCULOUS. H. G. Wetherill, Denver. Journal American Medical Association, Jnuary 6, 1923.

PREOPERATIVE COMPLICATIONS—THE PULMONARY TUBERCULAR PATIENT AS A SURGICAL RISK. C. E. Yount, Prescott, Arizona. American Journal of Surgery, Anesthesia Supplement, January, 1923.

PREOPERATIVE COMPLICATIONS—PRESENT STATUS OF THORACIC SURGERY. F. B. Gurd, Montreal. American Journal of Surgery, February, 1923.

POSTOPERATIVE CARDIAC INSUFFICIENCY. E. Blanco Acevedo. Anales de la Facultad de Medicina de Montevideo, September-October, 1922.

POSTOPERATIVE COMPLICATIONS—THE CURATIVE VALUE OF BLOOD TRANSFUSIONS IN POSTOPERATIVE MASTOID CONDITIONS. Harold Hays, New York City. American Journal of Surgery, December, 1922.

POSTOPERATIVE COMPLICATIONS—FLUIDS AND THEIR USE IN POSTOPERATIVE TREATMENT. E. L. Ruble, Kansas City, Mo. Medical World, December, 1922.

POSTOPERATIVE COMPLICATIONS — SOME UNUSUAL PHENOMENA FOLLOWING ANESTHESIA. J. E. H. Atkeisson, Chicago. American Journal of Surgery, Anesthesia Supplement, January, 1923.

POSTOPERATIVE INSANITIES. D. J. McCarthy, Philadelphia. Pennsylvania Medical Journal, December, 1922.

POSTOPERATIVE PAIN. C. E. Whiting, Brookings, S. Dak. Dental Digest, February, 1923.

POSTOPERATIVE LUNG SEQUELAE. Jay Perkins, Providence, R. I. Rhode Island Medical Journal, February, 1923.

POSTOPERATIVE PNEUMONIA. Herman Elwyn, New York City. Journal American Medical Association, December, 1922.

POSTOPERATIVE PULMONARY COMPLICATIONS. C. O. Cooke and Wilfred Pickles, Providence, R. I. Rhode Island Medical Journal, February, 1923.

POSTOPERATIVE COMPLICATIONS—LUNG ABSCESS FOLLOWING TONSILLECTOMY. F. N. Bigelow, Providence, R. I. Rhode Island Medical Journal, January, 1923.

POSTOPERATIVE COMPLICATIONS—POST-TONSILLECTOMY PULMONARY ABSCESS. Mary E. Botsford, San Francisco. California State Journal of Medicine, January, 1923.

POSTOPERATIVE COMPLICATIONS—THE MINOR FORMS OF PULMONARY EMBOLISM AFTER ABDOMINAL OPERATIONS. L. R. Wharton and J. W. Pierson, Baltimore. Journal American Medical Association, December 2, 1922.

POSTOPERATIVE COMPLICATIONS—FATAL INFECTIONS FOLLOWING TONSILLECTOMY. I. H. Tumpeer and A. Levison, Chicago. Journal American Medical Association, January 6, 1923.

POSTOPERATIVE COMPLICATIONS — RESPIRATORY COMPLICATIONS AFTER SEVEN THOUSAND ADMINISTRATIONS OF GENERAL ANESTHETICS. D. C. Aikenhead, Winnipeg. Canadian Medical Association Journal, December, 1922.

POSTOPERATIVE COMPLICATIONS—THE POSTOPERATIVE CARE OF URINARY CASES. A. L. Schute, Boston. Southern Medical Journal, February, 1923.

RESPIRATION—DIAGNOSTIC AND PROGNOSTIC VALUE OF THE BREATH HOLDING TEST. F. H. McMechan, Avon Lake, O. California State Journal of Medicine, November, 1922.

RESPIRATION—THE BREATH HOLDING TEST AS A SAFETY-FIRST FACTOR IN DETERMINING SURGICAL RISK AND OXYGEN NEED UNDER ANESTHESIA. W. I. Jones, Columbus, O. Current Researches in Anesthesia and Analgesia, December, 1922.

RESPIRATION TEST, THE SUSPENDED, WITH PARTICULAR REFERENCE TO ITS VALUE IN CASES OF TOXEMIA OF PREGNANCY. Gilbert FitzPatrick, Chicago. American Journal of Surgery, Anesthesia Supplement, January, 1923.

RESPIRATION, EFFECTS ON CIRCULATION AND, OF AN INCREASE IN CARBON DIOXID CONTENT OF BLOOD IN MAN. E. C. Schneider and D. Truesdell, Mitchell Field, L. I. American Journal of Physiology, December, 1922.

RESPIRATION — DETERMINATION AND INTERPRETATION OF CHANGES IN LUNG VOLUME IN CERTAIN HEART LESIONS. Christen Lundsgaard, New York City. Journal American Medical Association, January 20, 1923.

RESPIRATORY EXCHANGE, EFFECT OF SUPRARENAL INSUFFICIENCY ON. D. Marine and E. J. Baumann, New York City. Journal of Metabolic Research, July, 1922.

RESUSCITATION, INTRACARDIAC INJECTIONS. D. W. Crile, Chicago. Surgery, Gynecology and Obstetrics, December, 1922.

SCOPOLAMIN ADDICTION. E. D. Paulian. Bulletins de la Societie Medicale des Hopitaux, November 24, 1922.

SHOCK, DIMINUTION OF POSTOPERATIVE BY PREOPERATIVE DESENSITIZATION. J. L. DeCourcy, Cincinnati. American Journal of Surgery, December, 1922.

SHOCK IN GYNECOLOGY AND OBSTETRICS. A. Turenne. Anales de la Facultad de Medicina Montevideo, September-October, 1922.

SHOCK TREATMENT OF PUERPERAL INFECTION. M. Renaud. Bulletins de la Societie Medicale des Hopitaux, October 27, 1922.

UROLOGICAL ANESTHESIA. French S. Cary, Chicago. American Journal of Clinical Medicine, December, 1922.

TETANY, EXPERIMENTAL. E. W. H. Cruickshank. China Medical Journal, November, 1922.

American Journal of Surgery

QUARTERLY SUPPLEMENT of ANESTHESIA & ANALGESIA

(American Journal of Anesthesia and Analgesia)

Printing Papers from the Transactions of the

Interstate Association of Anesthetists
American Association of Anesthetists
Canadian Society of Anesthetists
Scottish Society of Anesthetists
Mid-Western Association of Anesthetists
Pacific Coast Association of Anesthetists
National Anesthesia Research Society
New York Society of Anesthetists
Royal Society of Medicine, Anesthetic Section
Boston, Providence, Toledo, Louisville, Indianapolis, Chicago, Kansas City, Colorado, Seattle, Northern and Southern California Societies of Anesthetists

F. H. McMECHAN, M.A., M.D., Editor

Associate Editors

JAMES TAYLOE GWATHMEY, M.D.
DUDLEY W. BUXTON, M.D., M.R.C.P.
WILLIS D. GATCH, M.D., F.A.C.S.
JOHN D. MORTIMER, M.D., F.R.C.S.
PROF. C. BASKERVILLE, Ph.D., F.C.S.
ARTHUR E. HERTZLER, M.D., F.A.C.S.
WM. HARPER DEFORD, D.D.S., M.D.
ISABELLA C. HERB, A.B., M.D.
G. A. H. BARTON, A.B., M.D.
SAMUEL JOHNSTON, M.A., M.D.
FRANCIS E. SHIPWAY, M.A., M.D.
CHARLES K. TETER, D.D.S.
CARROLL W. ALLEN, M.D., F.A.C.S.
EDWARD H. EMBLEY, M.D., B.Ch.
TORRANCE THOMPSON, M.D.
PROF. YANDELL HENDERSON, Ph.D.
E. I. McKESSON, A.B., M.D.
ARTHUR E. SMITH, M.D., D.D.S.
J. F. W. SILK, M.D., O.B.E.
H. E. G. BOYLE, O.B.E., M.R.C.S.

July — *CONTENTS OF THIS ISSUE* — *1923*

THE ANESTHETIST'S POINT OF VIEW	Wm. Webster, Winnipeg, Canada	66
SHOCK PROPHYLAXIS	Charles J. Wells, Syracuse, N. Y.	68
METHODS OF TEACHING GENERAL ANESTHESIA TO DENTAL STUDENTS	E. W. Martindale, Columbus, Ohio	74
POST GRADUATE IN ANESTHESIA FOR DENTISTS	Henry I. Dorr, Winchester, Mass.; Theodore D. Casto, Philadelphia, Pa.	76
THE VALUE OF PRESSURE CONTROL REBREATHING IN ETHER ANESTHESIA	J. J. Vega, Dayton, Ohio	80
SYNERGISTIC ANALGESIA	Frank D. Smythe, New Orleans, La.	85
THE PROBLEM OF SERVICE IN THE RELATIONS OF THE PROFESSIONAL ANESTHETIST TO THE SURGEON	Ansel M. Caine	89

DEPARTMENTS

BOOK REVIEWS	91	EDITORIAL. THE HEART IN SURGERY	92
MORE HONORS FOR MORTON	93	QUARTERLY INDEX	94

THE ANESTHETIST'S POINT OF VIEW.*

WM. WEBSTER, M.D., C.M.
Senior Anesthetist Winnipeg General Hospital,
WINNIPEG, CANADA.

It would appear from contemporary history that the anesthetist's side of the question in an operation had never been taken into consideration. True, his opinion as to the advisability of anesthesia and operation may be asked before the operation takes place, especially when the condition of the patient is serious; and I confess receives due consideration. There are a few surgeons however, who, probably partly through thoughtlessness and partly owing to the present day knowledge and skill of the anesthetist, appear to forget that anything is required of themselves in carrying out to the most successful conclusion, whatever operation is in hand, with a minimum of immediate danger to the patient and of discomfort during the early convalescent period.

NECESSITY OF CO-OPERATION BETWEEN THE SURGEON AND ANESTHETIST.

Most surgeons now-a-days exercise due care not to commit any unnecessary traumatism of the tissues, some in fact are exceedingly careful on this point and the anesthetist is correspondingly grateful. They have realized the necessity of close co-operation with the anesthetist, and leave to his judgment without question, the choice of anesthetic and method of administration for the case in hand. Unfortunately there still remain some whose sole idea is that they should adopt any technic they think fit, the anesthetist—who apparently is only an inconvenient incident in the scheme of things—administering the anesthetic in favor of which they are prejudiced, without regard to its suitability; and who apparently consider it unnecessary, as their patient is anesthetized, to worry in the least about the amount of pulling and hauling done to sensitive tissues and the consequent reaction on the organism, most of which reaction will probably be charged to the anesthetic in the minds of those in attendance.

Some, who have always operated under ether anesthesia, expect exactly the same condition of the patient when under N_2O—O, and at once condemn the latter as of no use if it does not conform to their exacting requirements, instead of trying to modify their manipulations in some degree to the possibilities of the anesthetic. They demand absolute flaccidity of the abdominal parietes, or of the soft palate while inserting the adenoid currette.

DEMANDING THE IMPOSSIBLE.

In operations about the mouth and nose where, as frequently happens, one is not sufficiently fortunate to have compressed air on hand or a motor driving an air pump, and when using a vaporizing inhaler is compelled to pump the necessary air with a foot bellows, we may behold the anesthetist standing on one leg with the other pumping more or less vigorously at the bellows in order to force air through the inhaler to vaporize the anesthetic, which inhaler has to be kept in mind and sometimes regulated during the operation.

Suppose, *for example,* the operation is a tonsillectomy and adenectomy. In the patient's mouth is a gag, and anesthetic tube and a suction tube, all under the anesthetist's care. The first tonsil is removed; the hemorrhage is in most cases readily controlled. Occasionally, however—and this usually in patients who are least easily anesthetized on account of muscular development, plethora, obesity or throat irritability—some vessel in the fossa bleeds freely, necessitating the application of an artery forcep. Dabs into the fossa with the aforesaid forcep are sometimes successful at once, but often have to be repeated several times before the vessel is clamped. Perhaps at the end of some five or six minutes, two or three pair of artery forceps are hanging on to the tissue at the base of the fossa; the anesthetist being meanwhile requested to hold the handle of each one as it is successfully clamped. This he must do so as not to interfere in any manner with the view or comfort of the operator, or he is reminded in no measured terms of his shortcomings.

Although both hands and feet, one would imagine, are now sufficiently occupied, he is lucky if not asked to take a tongue depressor and hold down the tongue. Meanwhile, if in his anxiety to maintain free respiration with this bunch of hardware cluttering up the patient's mouth, tending to force back the tongue and so block the airway, a reflex contraction of the pharynx should occur to interfere momentarily with the operator's comfort, the vials of his wrath are at once poured out upon the head of the unfortunate anesthetist.

Shall I be charged with the crime of "lese majesté" if I suggest, that it would result in benefit to all concerned if the surgeon, who does a tonsillectomy, would learn to promptly and efficiently put an artery forcep on a bleeding vessel if sufficiently large to require it; and also tie the same if necessary: which of course is seldom the case. A great deal of time and profanity would be saved. The general surgeon often has to control bleeding in places quite as difficult of access and does so with apparently much less fuss and effort.

*Honorary Chairman's Address read during the National Anesthesia Research Society Congress of Anesthetists in Joint Meeting with the Interstate and New York Anesthetists Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

PRECAUTIONS IN ASPIRATING.

In using the aspirator to remove blood from the mouth the end should never be allowed to come into actual contact with the tissues in the tonsillar fossa, after the removal of the tonsil and when bleeding is present. If permitted to do this, one not only has the ordinary pressure of the blood trying to force its way through any open vessel, but assists the arterial pressure by suction on the bleeding extremity and prevents the stoppage of hemorrhage by formation of a clot or contraction of the vessel wall.

Further, it is seldom if ever necessary to actually rub the end of the suction tube or a swab of gauze over the posterior pharyngeal wall. The reflex thus excited, unless the anesthesia is profound, causes pharyngeal spasm with consequent interference with free respiration and possibly retching, resulting in a break in the operative progress. With one of the usual positions adopted for this operation, blood may be successfully aspirated from the pharynx without any actual touching of the tissues in this section.

With the patient under a general anesthetic there need be no unnecessary haste and a deliberate operation can be accomplished. The resultant hemorrhage, therefore, should seldom be such as to hold up the operation. Where this occurs the time lost is soon much greater than any lost from exercising due care. It is a fact that troublesome hemorrhage is far more common with some operators than with others.

In the removal of adenoids, is it imperative to invariably have the soft palate absolutely immovable while the curette is introduced? In the great majority of patients it is no difficult matter to obtain this relaxation but, on the other hand, an occasional case appears where this condition can not be obtained without considerable danger from overdose of the anesthetic, some patients being much more sensitive in this region than others. Some also, and these often of the type with the easily irritated pharynx, have a small margin of safety between complete anesthesia—as marked by loss of corneal reflex and muscular relaxation—and overdose. With these one verges too closely on the danger zone in trying to secure the desired relaxation.

THE PROBLEM OF COMBINED ANESTHESIA.

Where both a general and local anesthesia are used is not the anesthetist entitled to have a voice as to the quantity of local anesthesia which is injected; or as in some nasal operations, applied to the mucous membrane? Novocain, although possessing only one-third the toxicity of cocain, is far from being the innocuous drug one would imagine from seeing the quantity in which it is sometimes used. It is quite common to see from three to five grains injected in weak solution: I have seen as much as six grains given in this manner, and although some may escape from the tissues on incision it is an unknown quantity and often may not amount to much. In certain operations the quantity of general anesthetic required is diminished by use of the local; in others, owing to the site and character of the operation, or to some condition of the patient, as large a dose of the general anesthesia is required as if the local had been omitted. Unless a definite advantage is to be gained why use the local anesthetic and give the organism another poison to eliminate, at a time when all its recuperative powers are needed to combat the depression of the anesthetic and operation?

Although, so far, we have had no immediate untoward results from novocain in the large doses already mentioned, there is always the danger of some patient appearing, who possesses an idiosyncrasy for this drug. There is also the fact that the drug has to go through the process of absorption by the tissues and excretion by the kidneys, upon which a more than normal load is thus temporarily thrown, and if in damaged condition the extra strain might conceivably interfere seriously with the patient's future welfare. Again, is it necessary, in order to make an incision through skin and muscles, to inject as widely as is sometimes done? Were the area narrowed down a less quantity of drug would suffice.

Unfortunately cocain, as a local anesthetic, has not been so innocent as could be desired, when used in nose and throat surgery. There are numerous cases on record of sudden death occurring from its application to the mucous membrane, or its injection beneath the same. Many of these fatalities, following nasal application, have been thought to be caused by a reflex paralysis of the heart from the action of the drug on the nasal nerve-endings. In these cases the effect is produced very rapidly. Some patients, however, show distinct symptoms of poisoning, which rapidly progresses to a fatal ending in from fifteen or twenty minutes to a few hours.

Is it absolutely necessary, in order to produce the desired effect, to use cocain in such strong solutions as 10 and 20 per cent.? It would appear that such strong solutions present always a distinct element of danger. Cannot the desired result be obtained with more dilute solutions or by

the use of a less toxic drug? Of course in most cases of local application, absorption of the drug into the circulation must be fairly slow, and, so long as the absorption is not too rapid, elimination proceeds quickly enough to prevent undue accumulation. If, however, through some condition of the organism, elimination is delayed, or absorption is accelerated, we may have a poisonous accumulation of the drug and a resultant fatality!

KEEPING THE ANESTHETIST FROM THE SITE OF OPERATION.

A seeming lack of common sense is often displayed in the effort to keep the anesthetist away from the site of operation when this is about the head, neck or chest. He sits under a tent formed from a sheet, the other occupant being the patient's face. Here he respires the anesthetic vapor given off by the patient together with the latter's usually very foul breath. These, combined with the heat, apart from the unhealthfulness, tend to produce drowsiness, a far from deliberate condition, when all the senses are required to be most alert in order to insure the greatest safety to the patient. It is usually quite easy for the anesthetist to sit some four feet away from the site of operation, using a vaporizing inhaler, or even if administering N_2O-O. Contrast this with the surgeon and his assistants who often have their faces within ten or twelve inches of the wound and who are often in conversation, or the surgeon may meanwhile be lecturing to a class of students. After wearing his face mask for some ten minutes it becomes moist and filled with bacteria from the exhalations from his mouth and lungs. The temperature being well suited to their development, these, unless great care is exercised are sprayed on the wound during speech and are a source of danger to the patient. For a thyroidectomy, or in the removal of certain cervical glands, the anesthetic face piece being very close to the field of operation, the tent arrangement is necessary and desirable, and the anesthetist must perforce bear with the discomfort; but where the operation is a mastoid or amputation of the breast, the use of such a contrivance becomes almost ridiculous.

The problems mentioned are a few of the vexed questions which daily arise in the routine of the anesthetist's work and which I thought it might not be without benefit to make the subject of my address. Many of those present must have had similar or other unpleasant experiences at some period of their career as anesthetists. A free discussion of the same, especially between surgeons and anesthetists should result ultimately to the benefit of the patient, who is after all, the one who suffers most from any error of judgment, or lack of unity of effort, on the part of those in whose hands his welfare, for the time being, is placed.

167 MAYFAIR AVE.

SHOCK PROPHYLAXIS.*

CHARLES J. WELLS, M. D.,
Syracuse, N. Y.

The World War gave a great impetus to the study of shock in all its phases, but the subject is far from being settled, and still remains the dread of the surgeon and the anesthetist.

Gwathmey[1] in his book *"Anesthesia,"* says, "By far the most important complication, which may arise in the clinical experience of the anesthetist, is shock." Gasser[2] and his associates find, "In every case studied shock was associated with a concentration of blood and loss of volume." While Lee[3] notes that, "Profound disturbances of blood volume are always serious and if maintained for any considerable period are usually associated with death." And thus we might continue indefinitely, as to the character and seriousness of shock. In its less severe forms we frequently meet it in the guise of so called *stormy convalesence,* which is usually nothing else than the efforts of the patient to overcome the depressing effects of shock.

Theories differ as to the mechanism of shock, but we can be quite positive as to its cause and effects. It is along these lines that we, for the present at least, must base our treatment. They tell us, we are in an age of *preventative medicine.* If such is the case we will soon come to the same conclusion as A. R. Munroe, when he says, "If we pay proper attention to prophylaxis we should have few cases of shock following operations."

The customary routine preparation of a patient for operation has been to build up the patient to as near a normal condition as time and circumstances permitted. Then, to operate and when the clinical signs of shock developed, to undertake their treatment. The periodic recording of blood pressure reading during operation was a step in advance, for this gave us warning of impending shock several minutes ahead of clinical signs. But even with this

*Read during the National Anesthesia Research Society Congress of Anesthetists in Joint Meeting with the Interstate and New York Anesthetists, Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

factor of safety, shock was not prevented, and treatment for it was not begun until it was established. The treatment however was more efficacious than usual, because it was established earlier. *Taking my cue from this fact, I began the treatment of shock before the operation, in cases having or likely to have this condition, to see if shock could be still further lessened or mayhap entirely prevented.*

TREATMENT.

The *prophylactic treatment of shock* may be directed along four different lines,—(a) the retention of body heat; (b) prevention of harmful nerve impulses; (c) avoidence of shock producing features in surgical and anesthetic technic; and (d) prophylaxis of circulatory depression.

(a) A *subnormal temperature* accompanies shock. It is thus highly important to prevent the loss of body heat before, during, and after the operation. Traveling to and from the operating room is especially hazardous unless the patient is protected with plenty of wool blankets and at times hot water bottles. Special heating devices for the operating table are useful. With the temperature of the operating room not less than 80° F. together with as little as possible exposure of the patient and sufficient use of wool blankets, we should reduce the loss of body heat to a minimum.

I recently noted the pre-operative temperature of one thousand patients taken at random from my anesthetic records, and found to my surprise that there was a ratio of nearly 6 to 4 whose pre-operative temperature was below 98.6° F. This feature of the preliminary preparation of the patient should not be neglected, if we expect him to maintain the best physical condition.

(b) The patient must be protected from the baneful effects of the shock produced by *depressing influences, fatigue, worry, fear, pain,* and *various mental and physical discomforts.* The psychic treatment of shock is perhaps in many instances equal to the mechanical measures in its importance. It is actual attention to the preparation of the patient together with the encouragement of mental suggestion that inspires confidence and hope in the patient, and gives us his hearty co-operation. To this end the anesthetist as well as the surgeon should acquaint himself with the patient socially as well as physically before the operation.

When checking up the various physical abnormalities for therapeutic attention, we should pay particular attention to the character of the blood itself. It has been shown that a hemoglobinemia of 35 to 40 per cent is a contraindication for immediate operation.[4] Nor should we hesitate to give the patient the benefit of a transfusion whenever the impoverished condition of the blood may indicate it.

Physiological rest, in the form of nature's sweet restorer sleep, is one of the best forms of pre-operative treatment of shock. If the comfortable arrangement of the patient's surroundings does not bring this about, suitable hypnotics should be added. The preliminary hypodermic, in the absence of cyanosis, is an important feature in prophylactic treatment. It should be given at least one hour before the operation so that a soft pedal may be put on all mental and physical activities. It relieves apprehension and tranquilizes the patient and may *per se* prevent shock by lessening the amount of the anesthetic needed. The patient should always be carefully carried on a stretcher to the surgery. To walk or to be transported in a wheel chair, not only consumes the patient's strength, but also interferes with the effect of the preliminary medication. Long delays in waiting for operations have bad mental and physical effects, and early morning operations usually find the vital powers of the patient at a higher level. The effort to make the patient comfortable should not stop on leaving his room. Proper support to the various curves of the body with pillows ease his transportation to and from the operating table.

(c) *Certain phases of operative technic,* both of the surgeon and the anesthetist, add greatly in reducing the incidence of shock.

The surgeon may aid the prevention of shock by using sufficiently long incisions; sharp cutting instruments; steady and continuous retraction, (preferably with self-retaining retractors); careful hemostasis; two or more stage operation, if one would produce too much shock; local anesthesia as an adjunct to general anesthesia, when operating on borderline cases, to reduce amount and character of general anesthetic and depressing nerve impulses; the maximum of speed consistent with good surgery; and finally by using extreme care in examination and manipulation of all tissues. Remembering the examination of intestinal contents should be done with a wet glove and in the early part of the operation to produce the least amount of shock.[5]

ILLUSTRATIVE INCIDENT.

I wish to illustrate by recalling an experience, the moral of which is plainly evident. I was giving a nitros-oxid-oxygen anesthesia for the removal of a strangulated ovarian cyst. All was going smoothly, when the surgeon said, "I'll now reach down for

the pedicle." Unintentionally, but with considerable force he pulled up into the wound a piece of intestine instead. The blood pressure dropped at once to an alarming extent, respirations ceased, and the healthy pink color gradually began to fade into a sickening white. I shut off the nitros oxid and began to use oxygen for artificial respiration. Gradually normal conditions returned with no one but the anesthetist being any the wiser. The operation ended fortunately without circulatory depression in the patient, but it was some time before it disappeared in the anesthetist.

The anesthesia itself should be kept well within the boundry line of the first stratum of the third stage of anesthesia (Guedel) to prevent shock from too light or too deep anesthesia. The Fowler position under anesthesia favors shock because of cerebral anemia, while a moderate Trendelenburg position, if not too great for the right heart, prevents shock. Excessive fasting and purging before an operation favors shock by depleting the body fluids and increasing acidosis. It is said that, "a pink patient cannot die." Since asphyxia increases shock, it is essential that we prevent this by keeping the airway of the patient open, by artificial means if necessary, together with the addition of oxygen as needed. When nitrous oxid-oxygen is used oxygen is always at hand for this purpose. This form of anesthesia is by far the least shock producing. Crile[6] states that a patient will endure four times as much operative trauma under nitros oxid-oxygen as under ether anesthesia. Thus we see the selection of the anesthetic itself is one of the considerations in shock prophylaxis. Moreover everything connected with the operation should be in readiness so that the anesthetist is not compelled to keep the patient under the anesthetic a second longer than is necessary.

(d) The *altered circulation* present in shock produces a dehydrated body and accounts for thirst, rapid pulse, subnormal temperature, capillary stasis, marked pallor, cold clamy skin, sluggish or absent reflexes, and falling blood pressure. Thus the great necessity in shock treatment is supplying the body with sufficient liquids to keep the blood pressure buoyed up over the crisis.

If this done by the intravenous method the sponge-like action of a dehydrated body absorbs the excess fluid, and the process must soon be repeated. To delay this action some have used a gum-glucose solution with considerable advantage,[7] but the solution must be accurately and frequently prepared. The Murphy drip has been used during operations with good results. The hypodermoclysis method is advantageous, but not so large a quantity can be induced at a time by this means. Normal saline poured into the peritioneal cavity at the close of an operation, comes too late for prophylactic treatment, for what shock may occur is already established by that time. We can not put much dependence on drugs in the prevention of shock. Warbasse[8] says, "Alcohol and strychnine are usually contraindicated as they produce stimulation and irritation to the vital centers, which lasts but a short time and in the end contributes to their exhaustion."

W. B. Cannon[9] suggests that by the injection of sodium bicarbonate intravenously at the start of an operation, both of the unfavorable effects of operation, acidosis and circulatory depression, are avoided. This same result with less trouble and more lasting effect is produced by the use of the preoperative retention enema, as can be attested by many who have used it with great advantage.

The natural method for the introduction of fluids into the body is by way of the digestive tract. Considerable fluid may be taken into the body by mouth previous to the day of operation, but on that day the rectal route is to be preferred. The contraindications for the use of this method are chiefly those of rectal operations. The rectal route has the advantage of having the hemorrhoidal veins carrying its contents directly to the liver, where the material is properly transformed for the circulation. It is a difficult matter to keep a body super-saturated with liquids very long before the operation, because of the elimination of liquids by the kidneys, skin, and respiration. It is therefore necessary to introduce this amount *per rectum* just before the operation, if we want its *maximum effect at the time of its maximum need.*

TECHNIC.

To be successful in this, as in all phases of anesthesia, we must pay careful attention to the minor points of technic.

A light soft diet is given for the evening meal the day before operation. At 9:00 P. M. a cleansing soap suds enema, about 100° F., is given. Then, if necessary, a suitable hypnotic is administered to obtain a good night's sleep. At 5:00 A. M. the lower bowel is cleared by a low plain water enema. It is necessary that this be entirely expelled. One hour before the operation the preliminary hypodermic is given. In 15 to 20 minutes a retention enema of from one to two quarts of a 5 per cent sodium bicarbonate and 5 per cent glucose solution is administered. This allows time for the medication

to quiet peristalsis and thus favors retention of the enema. The percentage of the enema may be varied according to circumstances. The glucose both prevents and combats acidosis, acts as a stimulant, and at the same time furnishes to the body a food which can be easily assimulated.[7] (Occasionally we allow the patient, on the day before the operation, to eat a half a pound of candy which is rich in glucose). If the body needs require it, the glucose percentage in the enema may be increased to 20 per cent. In diabetic cases I have omitted the glucose and increased the sodium bircarbonate to 10 per cent. The enema should be given slowly,—at least 20 minutes by the watch, through a small well lubricated catheter. The hips are elevated in the Sim's position. The amount of the enema varies with the size of patient, nature of operation, and the patient's physical needs. The temperature of the enema should be as warm as can be comfortably tolerated. The patient should then be carefully lifted by the sheet from bed to cart, and so on until he is back in bed again. A slight Trendelenburg position on the operating table favors retention.

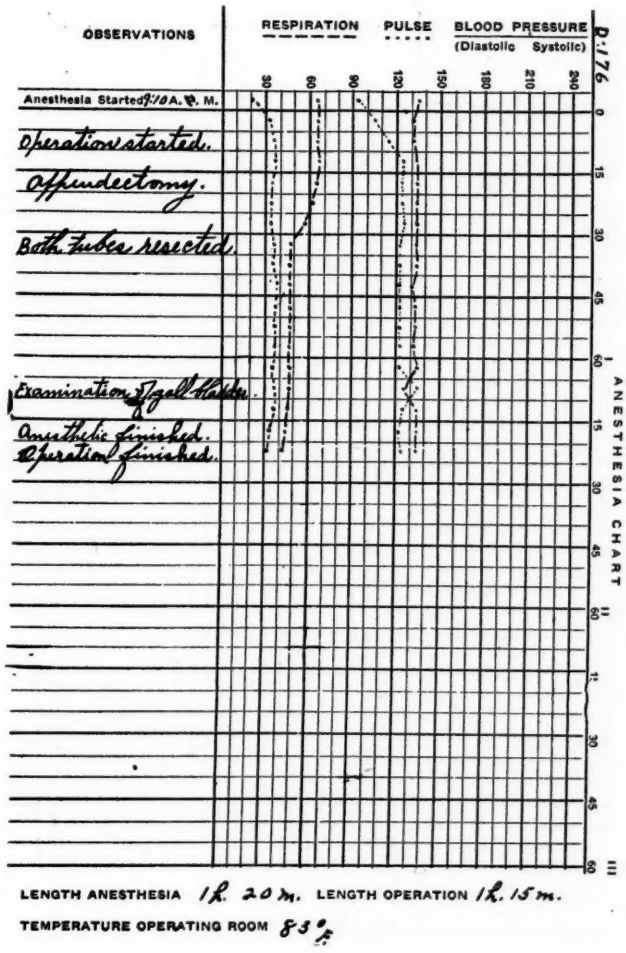


Fig. 1.

BENEFITS.

The following postoperative benefits have been noted.

1. Marked reduction in nausea and vomiting.

2. Lack or great reduction of thirst from 24 to 48 hours following operation.

3. Stimulation of elimination by early and full kidney function. (This is especially advantageous in such conditions, as certain urological cases present, where postoperative kidney function is often suppressed.)

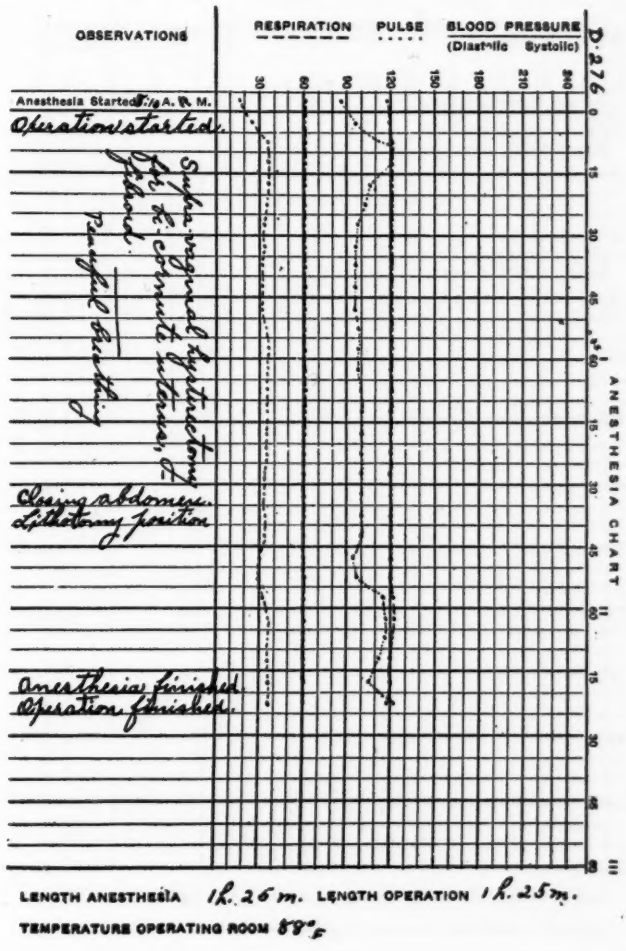


Fig. 2.

4. On recovery from the hypodermic there is frequently an increase in peristalsis with elimination of flatus and reduction in gas pains.

5. The first conscious moments of the patient are not filled with irritating efforts at intervenous and hypodermic medication, and the patient is allowed to comfortably rest under sufficient morphin to control postoperative pain. No additional medication *per rectum* is needed from 2 to 4 hours, if at all. When it is needed, I find that 6 to 8 ounces to be retained per rectum every 3 to 4 hours give better results and cause less irritation to the patient than the continuous Murphy drip.

6. Shortened convalesence and more rapid recovery due to absence or reduction in depressing effects of shock.

ILLUSTRATIVE CASES AND CHARTS.

Case 1. (Drs. G. M. Price and H. L. Gilmore, surgeons.) Is the first case in which I used the preoperative retention enema, which consisted of one quart of water at 100° F. The patient was in poor condition having suffered with double salpingitis for some time. To this was added a severe attack of acute appendicitis. Under the circumstances we naturally expected some shock. Appendectomy and

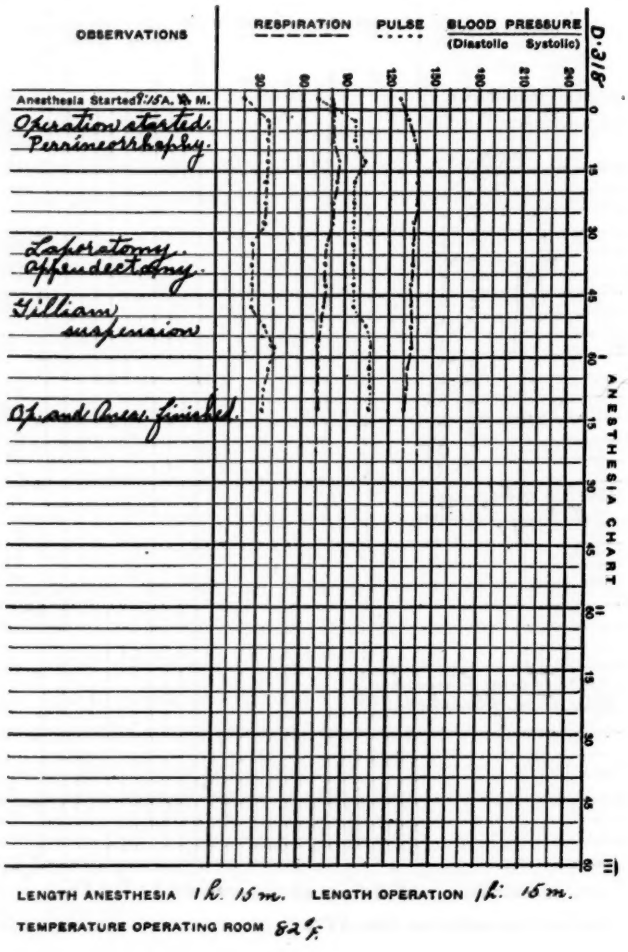


Fig. 3.

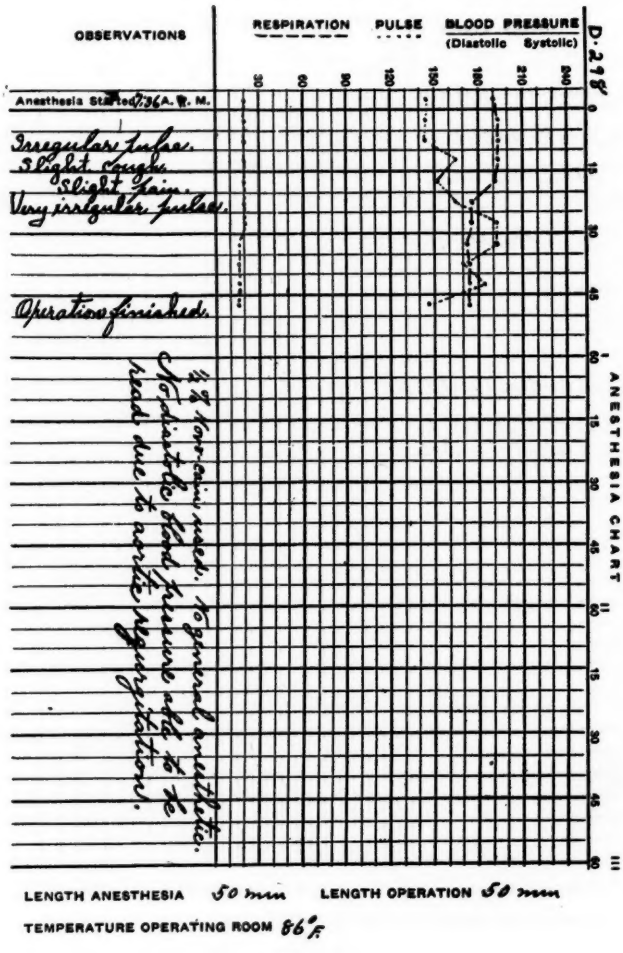


Fig. 4.

double salpingectomy were performed. No shock was experienced, except the slightest trace at the time of gall bladder examination. Somnoform ether anesthesia was used. Recovery was exceedingly gratifying, (Figure 1.)

Case 2.—(Dr. H. B. Pritchard, surgeon.) Is typical of many. The condition of the patient was good, but the nature of the operation was serious. A three pint preoperative retention enema of 5 per cent sodium bicarbonate and 5 per cent glucose was given. The systolic blood pressure remained practically the same throughout the 2½ hours of operation, in which there was a supravaginal hysterectomy of a firmly adherent bicornute uterus followed by an extensive perineorrhaphy. The retention enema caused no inconvenience to the operator during his pelvic manipulations. Somnoform-ether anesthesia was used. There was no nausea or vomiting, and recovery was as uneventful as the operative period, (Figure 2.)

Case 3.—(Dr. Frederick Flaherty, surgeon.) This operation consisted of a perineorrhaphy, and laparotomy with Gilliam suspension. Here is demonstrated a condition which frequently occurs in cases in which there is present a more or less persistent elevation in systolic blood pressure throughout the operation, and where the systolic blood pressure may end at a higher level than at its beginning. The supply of body liquids in these cases doubtless exceeds their operative demands. The anesthetic was nitros oxid-oxygen, (Figure 3.)

The three following illustrations are desperate risks.

Case 4.—(Dr. M. W. Dyer, surgeon.) Was a toxic goiter with severe cardiac and nephritic complications; 0.5 per cent novocain was used without a general anesthetic. A one quart retention enema of 5 per cent sodium bicarbonate and 5 per cent

glucose was given. You will note that *no diastolic* blood pressure was recorded. There was none, due to aortic regurgation. One side of the goiter was tied off. Systolic blood pressure was 180 mm. Hg. on return to bed. The pulse was erratic, but the amount of shock was trivial. A second operation on the other side, with the same preparation, was later performed with equally good result, (Figure 4.)

Case 5.—(Dr. Robert Burns, surgeon.) This patient was a young man of 28 years, who sustained a broken neck and fracture of left fore-arm in an automobile accident. Operation was delayed 24

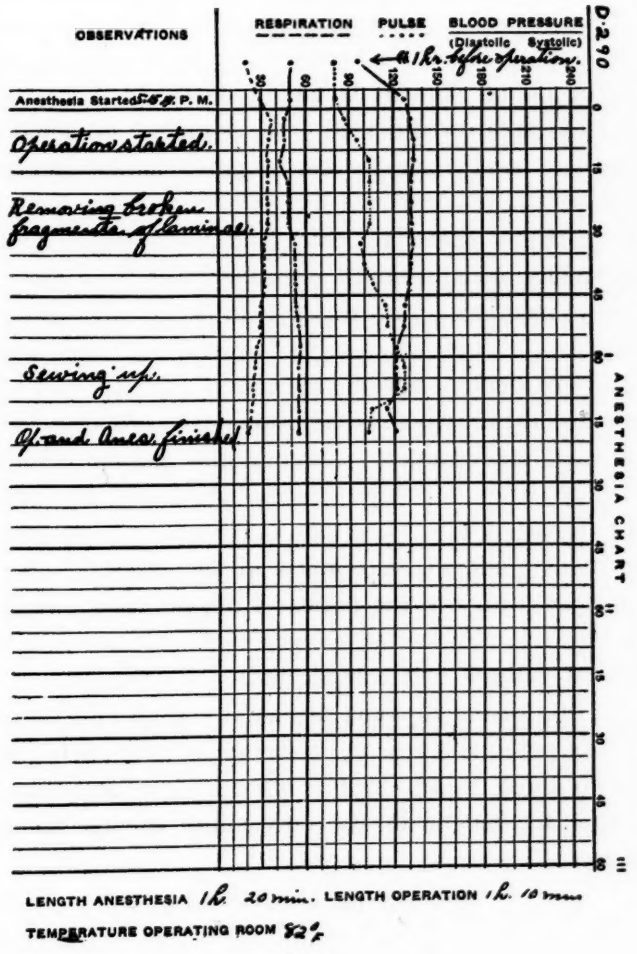


Fig. 5.

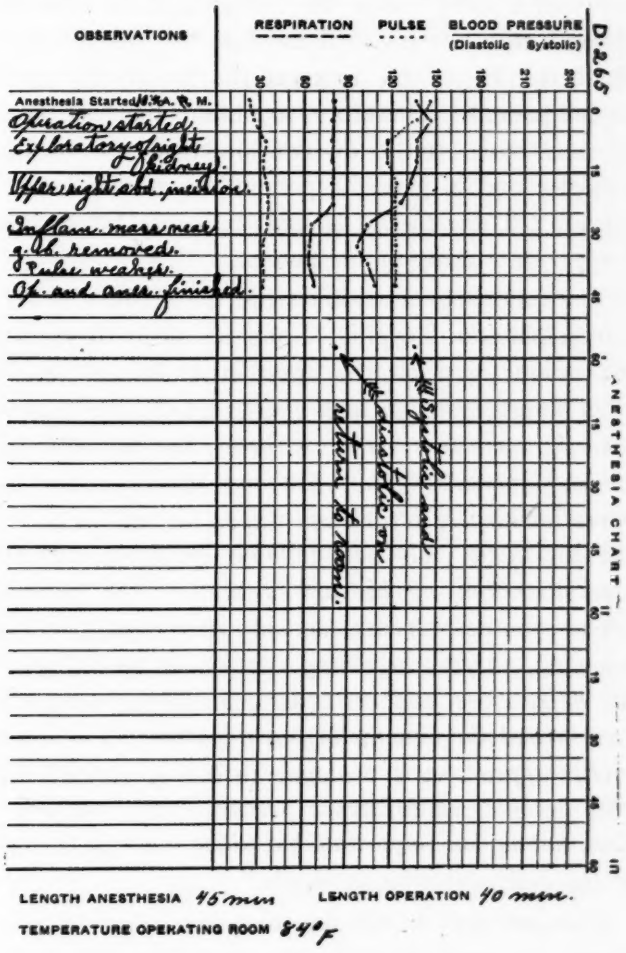


Fig. 6.

hours for reaction from shock and concussion. One hour before the operation the systolic blood pressure was 95 mm. Hg., which was perilously low for a serious operation. On giving three pints of 5 per cent sodium bicarbonate and 5 per cent glucose *per rectum* before the operation, the systolic blood pressure was raised to 128 mm. Hg. After being one hour and twenty minutes on the operating table, it had fallen to only 120 mm. Hg. The patient was conscious on leaving the operating room. Straight ether anesthesia was used, (Figure 5.)

Case 6.—(Drs. Edward Van Duyn and Phillip Cooper, surgeons.) This patient had been sick several months, and was such a poor risk that all expected her to die on the operating table. I had, four months previously, given her an anesthetic for a pelvic operation. On the present occasion she received a retention enema of two quarts of 5 per cent sodium bicarbonate and 5 per cent glucose solution. The operation consisted of a right kidney exploratory, upper right laporotomy, exploration of abdomen, and removal of large inflammatory mass on transverse colon. Here shock occured as it occasionally will, but with this difference, the depression was momentary and the rebound to normal much quicker and more certain than when no prophylactic treatment was given. The operation was completed in 45 minutes, and is a good example of the benefits of operative speed when coupled with good surgery. Recovery from operation and anesthesia was without circulatory depression. I recently gave a third anesthesia to this same patient with similarly good results. Nitros oxid-oxygen was the anesthetic in these operations, (Figure 6.)

CONCLUSIONS.

Because shock is of such consequence in all surgical procedures, it behooves the anesthetist to interest himself in this important phenomena. In our efforts to improve our equipment and technic, and to better the chemical formulae of our anesthetic vapors, let us not forget the patient in his battle against shock. The days of judging the physical capacity of a patient for operation by intuition alone, are passed. And now, we must not neglect the prophylactic treatment of shock, nor fail to systematically check up the patient's condition during the operation by recorded blood pressure observations. The more the anesthetist familiarizes himself with the physical condition of the patient, the better he is able to meet the anesthetic needs of the patient. Therefore, to obtain the best type of anesthesia, to be of real practical use to the surgeon, and to give the patient the service he deserves, *the anesthetist should be consulted in the preoperative study of the patient.*

The following quotation from the History of St. Bartholomew's Hospital, London, nicely describes the unique position the anesthetist should hold.[10] *"The anesthetist is a man apart. He has to undertake the same trust as the surgeon; the patient's life is in his hands. The ease and perfection of an operation largely depend upon upon his skill in giving the anesthetic. He acts without speaking, and his demonstration of his art is mute. The patient, whose pain he prevents, has only time to say, "Good morning," before becoming unconcious of the benefits he receives, and ere consciousness has completely returned the benefactor has departed. The anesthetist appears as a prologue to the operation, and then becomes an influence pervading the whole action, having an important but silent part in it, and at the end vanishing strangely."*

That we may better fill the position of "a prologue," as well as "influence pervading the whole action," I submit to your favorable attention the prophylactic treatment of shock,—especially the preoperative retention enema. Truly, "An ounce of prevention is worth a pound of cure."

1932 South Salina St.

REFERENCES.

1. Gwathmey, J. T.: Anesthesia, p. 383: D. Appleton and Company, 1914 Edition.
2. Gasser, Erlanger, Meek: Studies in Secondary Traumatic Shock. *American Journal of Physiology,* October 1, 1919.
3. Lee, Roger I.: *American Journal of Medical Sciences,* October, 1919.
4. Bazett, M. C.: Medical Research Commission, Serial Report, No. 25, p. 188, 1919.
5. Wells, C. J.: Clinical Observations on the Effects of Operation and Anesthesia on Blood Pressure: *American Journal of Surgery* (Anesthesia Supplement), July, 1922.
6. Crile and Lower: Surgical Shock. W. B. Saunders & Co., 1920 Edition.
7. Lowsley, Morissey, Ricci: The Use of Gum-Glucose Solution in Major Urological Department of New York Hospital. *Journal of Urology,* Vol. 6, p. 381, 1921.
8. Warbasse, J. P.: Surgical Treatment. Vol. 1, p. 216. W. B. Saunders & Co., 1919 Edition.
9. Cannon, W. B.: Acidosis in Cases of Shock, Hemorrhage, and Gas Infection. *Journal American Medical Association,* Vol. 70, No. 8, p. 535.
10. Moore, Norman: History of St. Bartholmew's Hospital. Vol. 2, p. 750: 1918 Edition. C. Arthur Pearson, Ltd.

METHODS OF TEACHING GENERAL ANESTHESIA TO DENTAL STUDENTS*

E. W. MARTINDALE, D. D. S.
Columbus, Ohio

The dental student is taught operative dentistry and operates on the teeth; he is taught prosthetic dentistry and restores lost organs; he is taught orthodontia and corrects irregularities of the teeth; he is taught materia medica and therapeutics, and prescribes constitutional remedies; but in a good many instances, sad to say, in most all dental schools, the student is taught but a scant theory and action of general anesthetics and is not expected to employ them, whereas he should be properly instructed and trained. He hesitates not at all to employ drugs and inject them hypodermically into the tissues, a procedure that is fraught with at least as many, and in the opinion of the essayist, more risks of injury to the patient from improper sterility and cleanliness and danger to the tissues which are so delicate and complicated.

If the dental diploma means anything, and there is any potentiality in it, it carries with it the right to do those things in the office of the possessor, which are taught in the curriculum of his Alma Mater.

NEGLECT OF ANESTHETICS

In all other branches of dentistry, wonderful progress has been made, out-stripping almost every other profession in the matter of advancement: but in this particular branch anesthetics which should have by right of discovery and inheritance, excelled all other specialties of medicine, the profession has been a laggard. This has been due to the fact that the teaching and training in the dental colleges has been so scant, consisting of a few dry lectures and a clinic or two or nothing at all. Anesthetics belong to dentistry by right of discovery and in-

*Read during the National Anesthesia Research Society Congress of Anesthetists in Joint Meeting with the Interstate and New York Anesthetists, Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

heritance, because several of the greatest benefactors the human race has ever known, Horace Wells, the discoverer of surgical anesthesia, Wm. T. Morton, the first to discover the anesthetic properties of sulphuric ether, and Georges Rolland, who by his experimenting, gave us the combination which he designates as somnoform, were dentists.

Had the dental profession eagerly followed in the footsteps of Wells, Morton and Rolland, and made more practical application of the great truths these men gave us, dentistry would today be far in advance of its present position.

If any one is entitled to adminster anesthetics it is the dentist; not so much because of priority of discovery, but because of the necessary pain inflicted to do his work properly. This question is often asked, "Has the dental surgeon the legal right to administer anesthetics?" Certainly. If he has received the proper intsruction in regard to the chemistry, physiological action, properties, and behavior of anesthetics; if he attended lectures on physical diagnosis and passed a successful examination in materia medica and therapeutics and possesses a diploma from a reputable dental college.

The college expects this graduate to prescribe cathartics, diuretics, diaphoretics and what not, in the treatment of incipient abscess: dietetic measures and eliminants in the treatment of pyorrhea: anodynes and tonics in the treatment of facial neuralgia: opiates and soporifies in the treatment of pulpitis: antacids and prophylactic measures to prevent caries. These things the dental school has emphasized, but only too often anesthetics have been forgotten or passed by as unimportant. Anesthetics have dignified medicine; anesthetics have made surgery; anesthetics can do nearly, if not quite, as much for the dental surgeon if he avails himself of their kind offices. The general surgeon wants anesthetics administered *primarily,* to prevent pain and avoid shock: *secondarily,* to facilitate operating. In some cases the patient could stand the pain of the operation without an anesthetic, just as the dental surgeon compels his patient to undergo the severest of pain in the chair. The general surgeon administers anesthetics to prevent shock, surgical shock that kills.

ANESTHETICS AT THE OHIO STATE UNIVERSITY

About eight years ago, when the dental and medical college of Columbus were taken into the Ohio University, steps were immediately taken to reorganize and equip all of the various departments of both colleges to the end that the students would be equipped with at least a working and practical knowledge of the subjects taught.

It was at this time the writer was approached by the Dean of the Dental College and requested to take the chair of Instructor in Dental Anesthesia.

The following assignment in the curriculum was made in the senior year anesthetics. Two credit hours the year, one recitation and three clinical hours each week and nothing less than this has obtained ever since. Recognizing the close relation, chemistry, physiology and pathology had to anesthetics, cooperation was established between the heads of these departments in the following manner,—organic chemistry in the first year; physiology full second year, and general and dental pathology in the third, also a full year.

With this ground work directing the student along helpful lines he approaches the senior year with these things which help to unfold a knowledge of properties, the physiological action, and the toxicity of all anesthetic agents.

My first efforts are extended along the line of convincing the student of the great advantages to be gained by the dental practitioner in the proper knowledge and use of anesthetics. This is done by emphasizing that they may be used for the following purposes. *First*: To prevent pain, thus eliminating fatigue, collapse and shock. *Second*: Short sittings are made possible, which is benefical to both the dentist and the patient. *Third*: Enables the operator to more thoroughly perform the operation in hand. *Fourth*: Enables the operator to accomplish an increased amount of work in a day *Fifth*: Dignifies dentistry, elevating it to the plane of surgery and augments the receipts of practice.

General anesthetics may be employed to great advantage in adjusting the rubber dam, when cavities of decay are to be excavated along the gingival margin, cavity preparation for filling and inlays, removing fillings in cases of pulpitis, opening into teeth having acute abscesses, lancing abscesses, extracting teeth and many other painful and fatigue producing operations. All these things the student has had or is having daily experience with and can now appreciate the benefits accruing to him in his clinical work as he does other methods and measures used to accomplish the high ideals held before him.

An interesting and entertaining study of the early history of efforts put forth to alleviate pain, arouses an interest on the part of the students and inspires them with a desire to do the work in the proper way. In the class room work the students

are carefully taught, the physiological and toxic effect of all the general agents used; how to select the proper anesthetic with consideration to sex, age, temperment, physical condition, nature and length of operation; how to meet and care for and instruct the patients to gain their confidence; also, how to personally attire and prepare themselves, and prepare the chair, equipment necessary for any emergency, and the operating room; the necessity of quiet assurance and confidence and their effect upon the patient.

They are taught the methods of receiving and handling the various agents, their advantages and disavantages, and the mechanical nature and method of handling all apparatus used in the giving of various agents; they are taught how to observe various symptoms and what they mean and how to control the same for the safety of the patient.

CLINICAL WORK

In all the clinical work consisting of two afternoons in the week, when all general anesthetics are given, which lasts throughout the entire senior year, the class work in sections of four to six. All through the first semester I may give the anesthetic personally, but in the second semester the students give the anesthetics under my direct supervision. Always the section is properly dressed and carefully cleaned up, and looking the best possible. The importance of absolute regard for clean and aseptic condition is positively forced upon them and becomes a part of their daily makeup.

Stress is put upon how to care for patients when something does go wrong and the students help to do these things under my personal supervision.

With the wealth of clinical material we have, each and every student has had a number of cases where he could operate upon a patient under the influence of a general anesthetic. These he has coming along all through the Senior year, and throughout the second semester of the year he has a number of anesthesias to his credit because this is just as much of a requirement as is the making of a creditable number of gold fillings.

This, we believe is the only way to give the student a working knowledge which will insure the greatest degree of safety to their patients. We do not expect to make specialists out of them, no! but some of them will be located in communities where all will depend upon them, and some will become specialists: some of our best men in the profession first got their determination when laboring to understand the effects of some general anesthetic agent upon patients under varying conditions, physical, nervous and pathological, while a senior student. Dental students thus prepared have an apportunity for rendering service to mankind, than which there is none greater.

"Not myself, but the truth in life
I have spoken,
Not myself, but the seed that in life
I have sown,
Shall pass into ages—All about me forgotten,
Save the truth I have spoken, the things I have done.

50 Ruggery Bldg.

POSTGRADUATE WORK IN ANESTHESIA FOR DENTISTS.*

HENRY I. DORR, M. D., D. D. S.,
Winchester, Mass.,
and
THEODORE D. CASTO, D. D. S.,
Philadelphia, Pa.

A postgraduate course in anesthesia is at the present time a recognized necessity and a definite advance over present undergraduate instruction. It offers the only opportunity to recent graduates and practitioners of dentistry, who are mindful of their deficiency in this special branch of their profession, to acquire the necessary qualification, experience and efficiency that would justify their assuming the humane responsibility in the use of the various anesthetic agents to induce that marvelous, mysterious slumber of anesthesia. Postgraduate instruction is also more appreciated than undergraduate instruction because the applicant more fully realizes the importance of proper equipment. He also has a more receptive mind and is willing to labor more arduously to acquire that information so much to be desired, with no question as to the value of this or that particular hour's work, as too often is the case with the undergraduate student.

METHOD OF PROCEDURE.

The applicants for postgraduate instruction in anesthesia should be men who have just graduated or have been in practice from three to ten years, but many times there are those who have used nitrous oxid for years and still wish further individuals instruction in the use of nitrous oxid-oxygen.

The classes should be small and the instruction should be individual, treating each student as a single unit and giving each one such personal supervision

*Read during the National Anesthesia Research Society Congress of Anesthetists in Joint Meeting with the Interstate and New York Anesthetists, Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

as his particular case may require. By skillful questioning the errors and false conceptions of the student may become known and such advice given as will enable him to readily grasp the truth as presented to him.

Students of the Latin races have great fear of a general anesthetic, and we have known them to be with the classes for an entire month without even taking an analgesic dose of nitrous oxid-oxygen. They thus lose a very important part of the first lesson. There is no step more important in this instruction than having members of the class take doses of the anesthetic as it is to be used in the future. In this way they obtain a very intimate knowledge of the physiological effects of the anesthetic, which is useful to them at the next lesson in the clinic or laboratory.

Confidence must be acquired in some way, either by reading, by actual experiments on animals, or in a supervised clinic where there is an abundance of patients, and the last step should be to give the clinic over for several days with the students in charge of the clinic in rotation. This is a most important day for the student. He assumes the responsibility of the clinic and is given the opportunity to test the knowledge he has acquired, and if he meets with success it will tend to establish that confidence so necessary to his future work. If results are not satisfactory he will return to the class with increased interest in the search for the reasons of his failure. We can all recall the day when it was our duty to administer an anesthetic for the first time. It is desirable, therefore, that the instructor ascertain by questioning as to the previous training of each member.

The first experience may have been in a hospital, where we were surrounded by every facility for the care of our patients, or in an office with a poorly trained assistant and where we were not prepared for an emergency. Under whatever conditions it occurred it was the period in our lives when we learned more about the anesthesia sleep than ever before in so short a time. *To administer an anesthetic uniformed is a crime; to do so with intelligence is a duty.* Each case furnishes a new chapter in our experience and an opportunity to study some new phrase of this wonderful, mysterious, physical condition in which we place our patients. Each student is led by a devious and varied course to obtain the special knowledge which equips him for this work. "It is precept upon precept, line upon line, here a little and there a little."

DIFFERENT OBJECTIVES.

To gain a knowledge of the individual experience of each member of the class with their previous training is very important to the instructor, as the fundamental basis of all teaching is to proceed from the known to the unknown. Different members of the class will have very different objectives; one will want to know how to induce analgesia or light anesthesia for work on sensitive dentin, while others will desire to prepare to do extraction, simple and complicated. The latter will require anesthesia of ten minutes to an hour's duration. Cavity preparation will be of less importance to him. He will want to know the gas-oxygen-ether sequence and must have a good training in physical diagnosis. This is the time in the history of the class when the students will begin to talk dosage and appliances for inhalation of the agents by the patient, and now must determine the agent to be used. For dentin operations and simple extractions for adults we recommend nitrous oxid-oxygen.

When children are to have teeth extracted, only requiring one minute of anesthesia, ethyl chlorid is the agent of choice in our experience. It can be given to a restless, crying child, as large mixtures of air are necessary to its safety, and the movements of the patient will not prevent him from receiving the proper dose. Three to six thicknesses of surgical gauze is the only appliance required and this kept moist by dropping the ethyl chlorid rather than spraying it on the gauze. The ethyl chlorid should not be allowed to freeze on the gauze mask. An annoying collection of mucus often occurs if the mask becomes frosty. This agent must be used to be appreciated and the class should have an opportunity in the clinic to see how effective it is in selected cases.

Five individuals should be the maximum for any class and three make a very workable unit. While discussing agents and dosage, the members of the class should be permitted to take small quantities of the agents sufficient to induce analgesia to the point where sensitive dentin may be cut out, following which complete ansthesia may be induced. They will understand the feelings and be better prepared to tell their patients what they are about to experience. At this point it should be impressed upon the class the great mistake that an operator makes in continually taking gas-oxygen, as this habit grows and becomes dangerous. We admit that it is very pleasant and possibly safe if there is always someone present, but it does not impress the patient favorably to see the man who is going to give him an anesthetic staggering around under its influence.

LABORATORY EXPERIMENTS

The class having now made observations on dosage

is prepared to go to the laboratory to experiment upon animals. It seems, therefore, the proper time for them to read some experimental work in this field. They are then given a reprint by one of us (Casto) on "Changes Produced in the Blood by Gas-Oxygen Anesthesia," and are requested to read carefully reports of experiments 20 to 49 inclusive, which deal with dosage and physical indications following the adminstration of each of the mixtures. In our opinion, to duplicate these experiments will be of great benefit to all of the class. They will be interested in the changes in the blood, particularly the reduced hemoglobin, which may be examined by the spectroscope or whatever means the laboratory may provide for this purpose. It is quite important to have the class participate in all the laboratory experiments. Some of its members may be able to make differential blood count or make one of the tests for carbon dioxid in the plasma. The hope is always present that some member of the class may develop the true spirit of inquiry, enter the field of the unknown and bring to light some important fact.

Rabbits may be selected for the first experimental work in the laboratory. The smallest automobile inner tube is selected and from this a section ten inches long is made to connect with some gas-oxygen machine inhaling tube. It will be found that this will fit the animals head and the length makes it a very good rebreathing bag being near the head just where the rebreathing bag should be. In administering all anesthetics, whether to animals or man, the anesthesia is slowly induced. The aim should be not to see how little oxygen, but how great a quantity may be given in inducing anesthesia. Not in how short a time, but how safely may anesthesia be produced.

Cyanosis is to be avoided in every case if possible, and if these precautions are taken, the jactitation so frequently experienced with nitrous oxid anesthesia produced in from forty-eight to sixty seconds, will not often be seen. It is our opinion that these spasms and tense musculature are only an expression of the natural impulse against such a rapid change from conciousness to anesthetic slumber. We hold in contempt the method of filling a five gallon bag with nitrous oxid, placing the inhaler tightly over the patient's face and inducing cyanosis and anesthesia in less than a minute. This is just the procedure in many clinics where anesthesia is produced by nitrous oxid to be followed by ether.

The white ablino rat, *Mus Nowegicus Albino,* is one of the most desirable small animals for our experiments. During many generations it has been accustomed to a domestic existence and, therefore, is not easily frightened, thus giving us one of the first anesthetic requirements in man or animal—the total absence of fear. This small animal is placed under the bell jar and the jar sealed, except for a tube through which to deliver the gas and another small opening for its escape. This gives us one of the best ways to study dosage and the effects of the various percentages. The subject is free to move about much the same as he has done in the colony house. The eyes are fine indicators of any cyanotic effects, and the way the hind legs are dragged or pulled around will help to further indicate the effects of our respective mixtures.

The dog is another animal of choice. If he is carefully managed there will be no need of trying him in any way, except to place a broad abdominal band in position during the first stages of the anesthesia. The class will ask why this band or compress is used and thus an excellent opportunity is given to explain the splanchnic circulation and how the vascular tissue of the abdomen may hold the larger part of the animal's blood when the body is relaxed, as may occur during shock or anesthesia, and, therefore, we will have a dangerous condition from improper distribution of blood in the body.

This animal will give the class much excellent experience in artificial respiration, as we have not anesthetized a dog that did not die or come very near doing so during the first twelve minutes, and many times during the first five minutes, while a very mild dose was being given.

We have described elsewhere the automobile tube used over the animal's nose and how it becomes a rebreathing bag. This gives the class a splendid opportunity to study the influence of breathing "to and fro" as Hewitt says, and how readily respiration may be forced by closing all exhaust valves and just as readily cease if no carbon dioxid is given, and only the gases are delivered.

The dog after the first fifteen minutes under gas becomes a machine in your hands to demonstrate all the symptoms of acapnia and anoxemia. The literature is abundant on this subject and the class should be directed to the writings most important to read on this subject. We highly recommend the contributions to the American Year Book of 1916 by Frank C. Mann, Willis Drew Gatch, George W. Crile, and Yandell Henderson, and after the knowledge obtained from reading these subjects thoroughly the class will have deaths in the laboratory, and many

of the very best hours will be spent in discussing these laboratory deaths.

We must recall that one dog died during the first fifteen minutes of anesthesia. The youngest member of the class, who was called the questionnaire, looked up from the operating table and asked,"What have we learned from this experiment?" The instructor said the answer to the question was *that there were five dentists whom he would not want to give him an anesthetic*. After the laboratory was placed in order, we adjourned to the lecture room where the subject was further discussed.

CLINICAL WORK.

After five periods in the laboratory of two to five hours each, the class may be taken to the clinic where there should be an abundance of patients and each student should be given some particular work to do or some point to observe.

The first work in the clinic will be to secure a chart for physical diagnosis and fill it out with a thorough examination of the patient by questioning him as to his previous and recent diseases, especially those of childhood. Has he been confined to bed? When and how long? If these questions lead into complications, the family history should be inquired into. Examination of the chest should be made by the stethoscope and if nitrous oxid is to be used a careful reading and record of the blood pressures should be made. The class must be taught to judge the probable risks, and to advise rest and medication to the applicants of the clinic with high blood pressure or a pulse that does not come near the normal of 40 or 45 millimeters of mercury. The class should be divided in the following order to make workable units:

Student 1 should hold the mask and give the gas.

Student 2 should count the pulse and take the blood pressures every three to five minutes and record his findings on a chart, indicating every change to the second.

Student 3 should count the respirations and make records to the second, with general observations as to the conditions of the patient and the procedures in their exact sequences. His chart should show when analgesia, anesthesia and cyanosis occurred.

Student 4 should arrange the instruments and do whatever is required of him, with ease and dispatch.

Sutdent 5 should be made captain of the clinic. He should assist in every way at the operation and see that each one is supplied with the particular appliance he may require. He should have under his care wedges, mouth props, all instruments for opening the patient's mouth, the indispensable tongue forceps, and a hypodermic syringe for administering any restorative that may be suggested.

The experience received here will make students quite able to handle all the usual conditions that present in a dental clinic. The members exchange duties in rotation so that each member occupies a different station during each operation. In this way they will become familiar with every process and get the personal touch that will teach them to know the measured respiration of anesthesia. The condition known as lividity is difficult to explain in words but it is readily recognized and understood when seen two or three times. In the beginning the student often is unable to determine when he has produced anesthesia.

This knowledge is measurably increased only by the experience one gets in the clinic. It is remarkable how helpless the student appears the first time he sees a patient who has swallowed his tongue or has foreign material in his glottis which prevents the passing of air or gas. But when he is shown how readily relief may be obtained by pushing up the mandible or inserting the finger into the throat or by use of the tongue forceps, he feels more capable of dealing with such emergencies.

The men who are being graduated from the dental colleges today have had very good didactic instruction and will pass a very fair theoretical examination in all branches. They will rehearse readily the methods for resuscitation from shock or anesthesia. They will answer the questions on physical diagnosis with promptness. They have not, however, used a stethoscope or a sphygmomanometer and do not know how to interpret the findings of either instrument.

They have seen patients anesthetized and have possibly extracted a tooth for the patient but they have not had the personal touch that will teach them the steps in this complicated process. We do not condemn the demonstrators or the professor or hold in comptempt their methods; they have done everything that was possible with the equipment and time at their disposal.

How are these men to be prepared to do this particular work? It cannot be done while they are undergraduates so far as we are informed. It cannot be done by the itinerant instructor, although he may help. It cannot be done by going to an occasional dental meeting.

Centers of instruction must be established throughout the country where some good Samaritans will provide the physical equipment and where there is

an instructor competent to do research work and instruct students in accordance therewith. The dentist and physician are sorely in need of such service and the time is approaching when the anesthetist will be the captain of the operating-room, as he should be, rather than the surgeon, as is the case today.

In other words, let advanced knowledge replace inadequate teaching too long in vogue. To this end we are happy to announce that seed has already been sown and a crop will be gathered in due time which will prove the beginning of a glorious eve of ogress.

333 CHESTNUT ST.
7 RIDGEFIELD ROAD.

THE VALUE OF PRESSURE AND CONTROLLED REBREATHING IN ETHER ANESTHESIA*

J. J. VEGA, M.D.
Dayton, Ohio.

Pressure and *controlled rebreathing* in ether anesthesia are rapidly being recognized as the vital factors necessary for an ideal anesthetic. Whenever we consider the value of pressure and rebreathing in ether anesthesia, we should always bear in mind all the elements which are determining factors in estimating its value.

In ether anesthesia there are three representative types or systems, namely: (a) ether closed method; (b) ether open drop method and (c) ether with nitrous oxid-oxygen used as a vehicle for carrying the ether to the patient. Also vapor methods, such as the Connell system, and the numerous systems usually known as nose and throat apparatus. The first system that came to my attention was the closed rebreathing method of Bennett. Some of the striking things about this system were the *ease* of the induction and the *speed* of induction. By this method it was so easy to have the patient ready before the surgeon could scrub up. Objections to this system in particular were the tendency for cyanosis, and accumulative dosage of ether in the rebreathing bag, also more or less cumbersome adjustments to the face. I refer to the top heaviness of the machine. These objections except for cumbersomeness could be overcome by experience to a greater or less degree, that is to say, four breaths on, one breath off, or some such ratio, would give a fairly good general average.

*Read during the National Anesthesia Research Society Congress of Anesthetists in Joint Meeting with the Interstate and New York Anesthetists, Hotel Deshler, Columbus, Ohio, October 30-November 1, 1922.

The drop method (open or semi-closed in proportion to the thickness of covers used on the mask) never did appeal to me. There is in the mechanical world no accepted haphazard method of controlling any liquid or vapor with this sort of mechanics. One might say that there is no application of any liquid or vapor such as that applying of ether to a patient. Be that as it may, a scientist going around with a rag in one hand and a can of volatile ether in the other and controlling the even anesthesia is simply out of luck as compared to the machine control as I will now attempt to describe.

PLAN OF EVALUATING ANESTHESIA.

At the outset, I wish to state that the system used in checking an anesthetic is of vital importance in order to properly understand or interpret a given set of results. I wish that each one writing papers on their method of administration of anesthetics would lay down a plan or fundamental basis upon which deductions are made. The following plan has been suggested by Dr. Ben Morgan, of Chicago.

Circulation, respiration and reflexes.

Circulation (33 1/3 per cent.)
- (a) color
- (b) pulse
  - 1. rate
  - 2. volume
- (c) blood pressure (8 per cent.)

Respiration (33 1/3 per cent.)
- (a) rhythm
- (b) volume

Reflexes (33 1/3 per cent.)
1. lid
2. pupil
3. oscillations
4. diversions

Operating Room Politics

This simple plan I find of great value. In my work, I have developed a keen respect for the proper oxygenation of the patient's tissue and be it scientific or unscientific, I am unable to convert myself to sit by anesthetic with a blue patient. To be sure, blueness on our scale of observation would only mean 16 per cent. while if nothing else were out of line, the patient would be considered in good condition; but research workers like Paul Bert, 1876, Theodore Evans, 1845, and Yendel Henderson, 1914, point out the untoward effects of blueness and properly brand it as a degree of asphyxiation, which, if extended over any length of time, regardless of where it is found, ends in *acidosis*. The pulse rate can rapidly be ascertained and the volume estimated

by compression. The volume, however, to be properly ascertained necessitates blood pressure apparatus.

There is about one thing to say regarding respiration. Every patient that goes to sleep with a particular anesthetic agent and method will assume a particular rhythm, *i.e.*, rate and volume for himself. This rhythm may not appear to be very good rhythm, but if it is poor rhythm, it must continue poorly and if it is good it must continue good. In other words, the patient sets the pace and it is up to us not to disturb this pace.

Reflexes have received their share of attention in the literature both ancient and modern and it would seem that the last word has been said in its various detailed descriptions. There seems to be no *most* important reflex sign. It is the interpretation of the relative activity. I would here offer, however, one important observation, that has in a measure been entirely overlooked by some writers and barely mentioned by others, that is *divergence* of the eyeballs. While it is difficult to estimate the finer plane of anesthesia under which the patient is placed, by the relative divergence, yet it serves as the plane of demarkation between *too deep* and *too light* anesthesia. The ultra-scientific anesthesiologist might criticize this point from the standpoint of its not giving the finer control. To this objection, I would simply state that in the operating room it is quite necessary, when you are suddenly called to correct somebody else's anesthetic, to first ascertain if the patient is too deep or too light, and this is one of the best points to use in that respect.

With this plan as a basis, any anesthetic material or apparatus may be given a severe test of a knowing character, therefore, an opportunity to judge the relative merits of the various methods. It is a notorious fact that the more open method used with ether, as the open drop method, the more irritation of the respiratory tract; conversely the more closed the method the less irritation. In the open method, it has been so universally and conclusively demonstrated that patients actually breathe too much volume air per unit time under ether anesthesia, that it should scarcely need comment, thus destroying the carbon dioxid respiratory balance which gives us the postoperative pallor and a good healthy factor contributory to shock. Just because patients do not die can no longer be used as a standard of good anesthesia. On the other hand the closed method offers just the opposite criticism.

In the closed method the patient does not breathe enough fresh air to maintain a good color, the pulse becomes more steady with better volume, blood pressure increases, which is good for the patient in impending shock; respiration increases in rate and volume and the pupil becomes dilated. It is worthy of note, however, that the absorption of the anesthetic agent is materially aided by the closed method accompanied by better relaxation with a relatively less absorption of ether when the dosage is observed.

From the last two paragraphs, one would almost plead for a combination of these two ideas and wonder if it were not possible to so arrange the working mechanical principles so as to utilize the salient good points of each and eliminate the objectionable features of both. Let us have a device or system that will give us, as was forcibly brought out by J. R. McCurdy in his paper read last year at Niagara Falls, (basing his paper on his use of the Ben Morgan Apparatus), a flexible control on the rebreathing bag and a control of ether vapor in which accumulative dosage during rebreathing cannot take place. What possible objection could there be to such a device. Here we would have the control of (a) rebreathing (b) eliminating, at least a good share of the irritation from the ether; regulating at will, thus preventing the occurrence of blueness and rapid respiration, increasing same to lift the patient over chocky conditions that ever present themselves, by simply over-rebreathing and also evening up our vapor tension dosage as is suggested by the principle of carburetion.

THE CARBURETOR IDEA.

The carburetor idea would carry with it the principle which has been used for some years in the Connell apparatus, *namely,* mixing the proper amount of ether into the volume of air in known dosage. It is interesting to note that with the carburetor system the required cell saturation of ether vapor, or in other words the vapor tension is strikingly uniform for all patients from babies to the strongest *athletes* or resentful alcoholics. This carburetor principle was pointed out in the *Modern Hospital,* 1915, in an article describing a simple apparatus. At that time Dr. Morgan clearly demonstrated what had already been found and reported at the Peter Brent Brigham Hospital in Boston, in a much less complex apparatus. Other features, however, at this time were overlooked by Dr. Morgan. This then would further suggest that the difference in the tidal air, or the R. Q. would cease to be a point of continual annoyance to the anesthesiologist. In other words, one would not be obliged to drop ether at different rates for the various lung capacities in order to secure a given definite level of anesthesia,

but would need only to set the regulator at points on the scale known to deliver the desired tension. Further evidence of the percentage mixture of anesthesia has been recently brought out by E. A. Tyler, of Philadelphia, and other laboratory workers.

PRESSURE.

Pressure, in inhalation anesthesia has not had its proper place in the literature, although some very, very early work has been done on the subject. Paul Bert in 1878 repeated his experiments in 1883 relaxed the muscle of dogs with nitrous oxid, parts 80 and oxygen parts 20 under pressure of a plus 1/6 atmosphere. Thus for the first time demonstrating an inverse ratio between concentration of anesthetic element and relaxation. That is to say, use pressure and reduce the anesthetic element. Dale and Hill, 1921, brought the work of Paul Bert to new life and did many experiments substantiating this claim. In 1916, while Dr. Morgan was working on his open ether apparatus, he was lying on a cot inhaling through the apparatus, for some reason unbeknown, he placed his finger over the exhalation flutter valve holding it down tight and admitted ether slowly through the carburetor. A couple of hours later, when he was called for dinner, he was surprised to wake up and find the mask of his apparatus lying by his side. He had fallen asleep without being aware of the effects of the ether vapor. The next morning offered the first opportunity to repeat this experiment on somebody else, who happened to be a very important patient in his private practice. In the same manner he produced the pressure on the patient, the patient fell asleep without irritation, accompanied by perfect relaxation in a period of four minutes. The operation was a hysterectomy, and recovery was uneventful. The patient claimed she had gas instead of ether. A very small amount of ether was used in this case. The patient weighed 140 lbs. and was 38 years old. Dr. J. C. Martin, in 1888, used nitrous oxid 85 per cent. and 15 per cent. oxygen under 7 lbs. pressure on animals allowing a continuous flow and ventilation. He also added milk of lime to absorb the CO_2. The animal was anesthetized for 72 hours with the following results: Movement began in 15 minutes, tried to stand after 35 minutes, he walked and obeyed commands in 53 minutes but refused milk. The next morning he appeared normal and ate food eagerly. Therefore the experience of Dr. Morgan is nothing new on pressure.

At an altitude of 14,112 feet under 16 per cent. oxygen (Pikes Peak) Dr. Morgan and his party of three were able to exercise vigorously with a rebreathing of 1/6 tidal air under a pressure of 6 millimeters, but found they all became sick upon removal of mask. Most everyone became sick except the natives. Cunningham, of Kansas City, is able to permanently reduce some forms of high blood pressure, by simply putting the patient into a pressure cabinet, thus establishing a great improvement in circulation and ventilation of tissue that takes place under pressure. Haldane, Benedict Jones of Chicago and others, working on carbon dioxid and metabolism, point out that of the proximate 20 per cent. of oxygen inhaled from the air, only 2 per cent can be demonstrated to exist in the tissue and blood stream. Thus it would seem that under atmospheric pressure, from a source of 20 per cent. oxygen the tissue is able to absorb only one tenth of 20 per cent. Place the oxygen under pressure and the patient is able to absorb a higher percentage in his blood stream and tissue. What would be the results if we should place ether vapor under tension? It is a gas at the point of absorption. It would be a happy situation indeed if by pressure we could force into the blood stream the required amount of gaseous ether by using only 1/10 of the dosage ordinarily required without pressure. We do not hope to do this but it would seem that if the full ratio could not be accomplished we could, at least approach that ratio. Thus the relative concentration of ether vapor passing through the bronchial lung tissue would be greatly reduced. We also might suggest that air being used as a vehicle under pressure with its 20 per cent. oxygen might better ventilate the cells structure with oxygen.

PRESSURE AND CONTROLLED REBREATHING AS APPLIED TO MILITARY ANESTHESIA.

National Military Home (Patients Central Branch) has accomplished clinically comparative results which are startling as compared heretofore experienced by our unscientific drop method.

At the National Military Home, Dayton, Ohio, my variety of subjects to anesthetize quite well represents more extremes than is experienced in Civilian Anesthesia. About 80 per cent. of the cases presenting themselves for etherization are *Class C* Surgical Risks. For convenience of discussion let us divide the Class C Surgical Risks into six different groups. *Group* 1. In this group we have the Civil War Veterans with a minimal age of 75 and a maximal of 95 years. *Group* 2. Consists of those cases which have been gassed with chlorine, mustard and other gasses. *Group* 3. Active T. B. cases. *Group* 4. Empyemas. *Group* 5. Drug Addicts and Alcoholics. *Group* 6. Neuropsychiatric cases. About 5 per cent.

of operable cases are *Class B* Surgical Risks and the remainder about 15 per cent are *Class A* Surgical Risks.

Civil War Cases, with an average minimal age of 75 and maximal age of 95 years are rapidly inducted without danger. Blood pressure and pulse rate, as a general rule, are remarkably well sustained in spite of marked general arterio-sclerosis and cardiac complications. Respiratory rate is well maintained.

Gassed Cases require slower induction periods, because in about 3 per cent. of cases involved in which the inductions were rapid there were slight

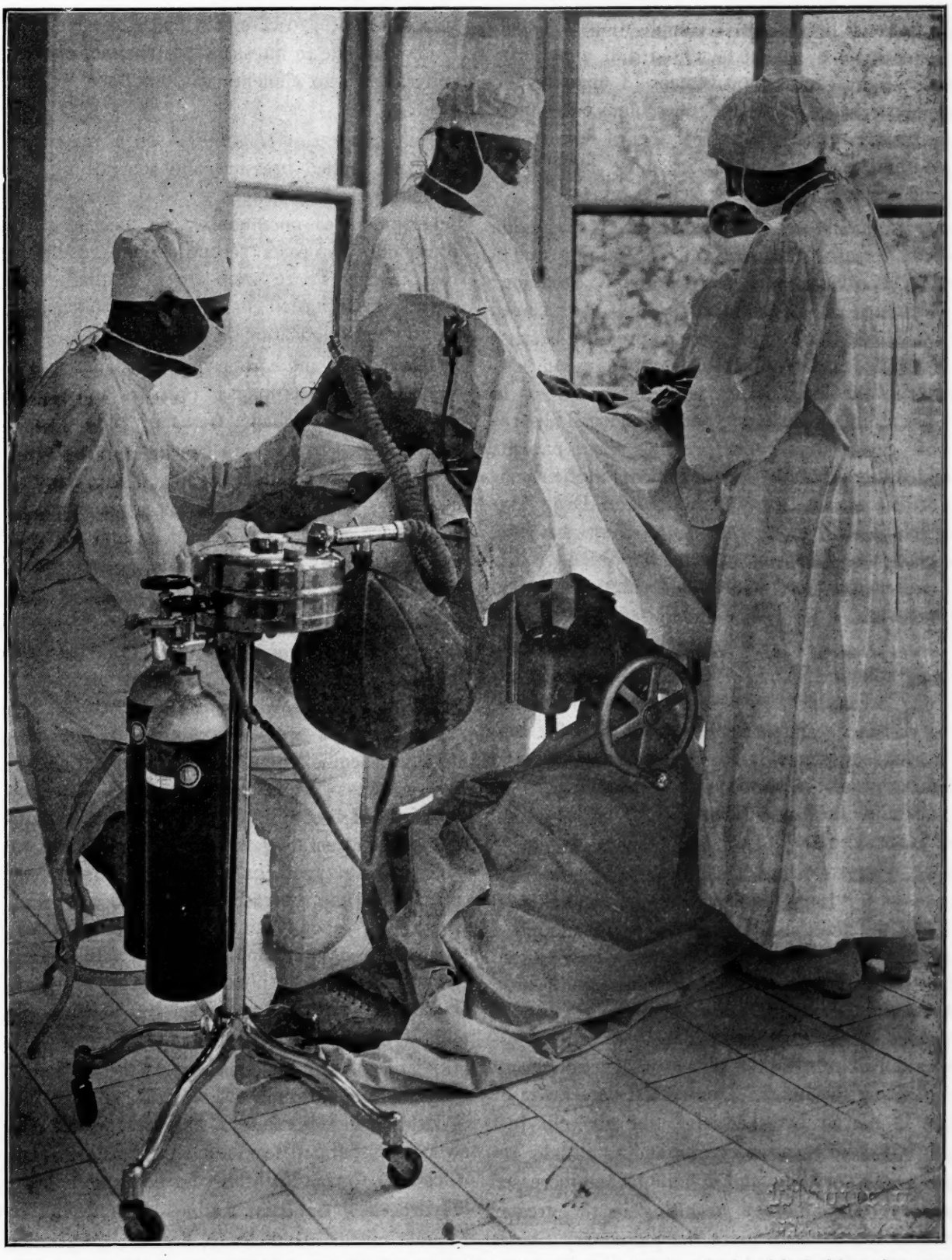


Fig. 1. J. J. Vega demonstrating pressure and controlled rebreathing in the Anesthesia of bad risk patients at the National Military Home, Dayton, Ohio.

postoperative hemorrhages. As a general rule this type of case takes a good anesthetic. About 90 per cent of gassed cases showed substantial gains in weight, increase of appetite, less frequency in recurrence of chest pains and hemoptysis.

Tuberculous Cases can be rapidly inducted without difficulty. Rebreathing of tuberculous patients causes lessened postoperative complications. Tuberculous cases are much benefited and a majority showed weight gains, improvement of appetite and fewer hemorrhages. In some tuberculous cases there was a lighting up of small apical foci of disease undetected before operation. Color, pulse, blood pressure and respiratory rate are well sustained.

Drug Habitues and Alcoholics during induction required increased pressure and rebreathing and a crowding of tolerance to get maximum relaxation; but as pointed out by McMechan, in 1911, received their anesthetic more rapidly under pressure because of the limited ability to absorb in the pressure of sclerosis in the lung tissue, as well as sclerosis in other tissues of the body prevents the normal absorption of gasses thus under pressure these patients responded like perfectly normal patients in their conduct of the anesthetic. Alcoholics and Drug Habitues responded more readily to the anesthetic, there being less confusion on induction, better relaxation and maintenance with notable improvement in their recoveries.

Neuropsychiatric Cases were best inducted by crowding tolerance plus increased pressure and rebreathing because we have to fight against marked mental resistance and increased activity of the central nervous system plus an increase of the H-Ion concentration of the blood due to the element of fear, (Studies in Exhaustion: III. Emotion, G. W. Crile, January, 1922).

Pressure and rebreathing and the degree of the inflation of the lungs is always under the care and control of the anesthesiologist. As to the amount of rebreathing partial or full which may be required in gassed, tuberculous, empyematous, alcoholics, drug habitues and neuropsychiatric cases this must be determined by close observation. However, the correct amount of rebreathing puts a greater volume of air ventilating the lungs. Diminished percentage of oxygen in the air breathed gives the air cells just enough increased respiratory rate and amplitude. Increased respiratory rate and volume means increased circulatory rate, thereby resulting in the greater volume of blood which gives the pulmonary tissues a great amount of nourishment, thus we can readily see that a greater absorption of oxygen is accomplished under the most unfavorable conditions.

RESULTS

Post anesthetic vomiting depends on many things besides the anesthesia. About 35 per cent. of cases involved show very little vomiting and in only a small percentage of cases was vomiting persistent. In a series of 770 cases ten had excessive vomiting. Four were due to intestinal obstruction, two to toxic goiter, three to cholelithiasis, and one to duodenal ulcer.

Pulmonary Complications:—In a review of 770 cases of applied pressure and rebreathing, five developed pneumonia, ages 20 to 94 years. Time of development of pneumonia. At the end of twenty four hours two cases, second day one case, third day two cases. There were three deaths. One had aortic regurgitation and mitral insufficiency, and two lung complications before operation.

The oxygen and carbon dioxid balance was always well maintained as long as pressure and rebreathing were properly applied. Cases of abdominal distension and gas pains were considerably lessened.

During any administration and especially during long etherizations the patients breathing must be kept free and unobstructed, color good and the character of breathing as shown by increase of pressure in bag should be carefully observed.

Pressure and rebreathing is not free from its dangers during administration and these can be prevented by careful and skillful administration as they are due to causes which can be generally foreseen. These dangers are:—Anoxemia due to failure to give sufficient oxygen. Over-concentration of ether vapor, excess CO_2 in the respired air. Rapid abdominal type of breathing can be overcome by emptying gas bag and refilling with nitrous oxid and a small amount of oxygen, or by simply cutting down the aperture to the rebreathing bag; and correcting percentage of vapor tension if indicated. CO_2 excesses are harmless and should be put to valuable use. In very difficult cases nitrous oxid can be given thus increasing positive pressure by keeping the bag slightly over distended.

At the present time there is at the National Military Home Hospital, Dayton, O., Albert Y. Cox, World War Veteran, age 27 years, weight 134 lbs., who was operated for double strangulated hernia on Oct. 12, 1922. Right hernia being complicated by Hydrocele. Contraindications to anesthesia were double mitral insufficiency, aortic regurgitation and stenosis. Color, pulse pressure and respiratory rate

were excellently sustained. This case was examined by Drs. McLean and Morgan about 48 hours after operation. Patient made an excellent recovery. No stimulants were required during anesthesia. Patient states that he was refused operation because of above mentioned contraindications at the following hospitals: St. Joseph's Hospital, Atlanta, Ga.; U. S. P. H. Hospital, No. 48, Atlanta, Ga.; Johns Hopkins Hospital, Baltimore, Md.; U. S. Marine Hospital, Savannah, Ga.; U. S. P. H. Hospital, Perryville, Md.; National Military Home Hospital, Dayton, Ohio, but was operated on at National Military Home Hospital as stated above when his hernias became strangulated.

The accompanying illustration shows the apparatus we use in applying the above principles in our anesthetic work. We have here a large metal container with a throttle control of the air intake. The control is made by turning this pointer from air to medium or strong, as indicated. While if the pointer rests at any given point, the patients inhalation carries with it the same definite vapor tension whether the paient be a child or an adult. This one way valve prevents the patient from breathing back through the source of supply, blowing ether into the face of the anesthetist, saturating the operating room air, the surgeon and attendants, and adds much for economy in consumption of anesthetic material. McKenzie of England in a recent paper pointed out the necessity of ridding the operating room of ether vapor and even went so far as to recommend an apparatus that might be used for such purpose, that the fatigue often experienced in operating is due more to the absorption of ether than to the work itself. In our own country we have plenty of examples, living and dead, where the absorption of ether alone is responsible for the results. Anemia, headache, gastro-intestinal and kidney disturbances are among the complications encountered.

The bag fastened onto a T connection has a sleeve valve controlled by a lever. Pulling down the lever, shuts off the bag entirely, which then permits of an absolute open method of air-ether. Pulling the lever up, opens the opening into the bag and when it is straight up it permits of too much rebreathing but the position for the use of nitrous oxid and oxygen from the tanks. For no rebreathing pull the lever down, and too much breathing, straight up. One can just split the difference according to conditions. Practically it is pretty well worked out, that the size of hole as indicated by No. 1 being the adequate amount of rebreathing for large robust patients, while No. 2 is the proper proportion for the average, No. 3 being used for children or patients breathing like children. Thus we have a perfectly simple and a easy working basis for the control of the rebreathing as has been pointed out by Dr. McCurdy of Pittsburgh.

You may now ask where the pressure comes into this system of anesthesia. The combination workings of this valve and the cut off to the rebreathing bag, will give you a positive pressure of from 5 to 8 millimeters provided the mask fits snugly on the face and the exhaling valve on the face mask is kept closed. Many of you before me are using this apparatus and therefore this explanation is unnecessary to you, but those who have not used this principle in their anesthetic work I trust, that I may supply them with sufficient knowledge of the benefits derived from these principles that they too might enjoy a new line of results in their air-ether anesthetic work.

NATIONAL MILITARY HOME.

SYNERGISTIC ANALGESIA.*

FRANK D. SMYTHE M. D.,
New Orleans, La.

I esteem it a privilege and an honor indeed to have been invited to deliver an address before this, the first meeting of your association. An organization of this kind has been greatly needed in the South, since the discovery of the first inhalation anesthetic, and it is surprising that the necessity and advantages of such an association have not ere this been keenly felt by Southern doctors.

On behalf of the surgeons and of those whom we serve, we greet you and bid you a most hearty welcome, and wish you God speed in your efforts and activities toward the development of the art and science of anesthesia; and my prediction is that your activities will exercise a powerful influence for good upon the profession and upon the public, and when the history of Southern Medicine shall have been written the names of the Founders of this Associations will be found occupying a place on the tablet of fame, among the benefactors and masters of other departments of medicine in our beloved Southland.

I congratulate you upon the formation of this Association and commend you for the virile interest you are taking in behalf of the most important of the medical specialties. The earnest workers of

*Read during the Organization Meeting of the Southern Association of Anesthetists, Read House, Chattanooga, Tenn., November 14-16. 1922.

your Association and of kindred associations will, in the near future, I hope, convince medical schools of the widsom and necessity of establishing the department of anesthesia in *fact* and not in name only as obtains today in practically all medical colleges in this country. Medical students have graduated in the past, and will graduate in the future, more poorly equipped to administer an inhalation anesthetic, than they are qualified, as a result of their training while in college, to discharge any professional duty of equal hazard or of equal importance. The course of instruction is so meagre and such a make-shift that we are warranted in saying that the period of study, both didactic and clinical, devoted to the art and science of anesthesia, is assigned to such an abscure place by the curriculum that the student, in his march to the green room, receives but little more than a formal introduction to the department of anesthesia, notwithstanding the fact that the mortality and morbidity incident to the inhalation anesthetic, administered by the untrained, is *per se,* higher than the mortality of numerous diseases that the physician will be called upon to treat in the practice of his profession.

You have undertaken to perform the task of removing the specialty of anesthesia from the humble and obscure position, which it at present occupies in the minds of many operators and in the public mind, to the exalted position which its transcendent importance justifies. This task demands upon your part honesty of purpose, industry, eternal vigilance, and a Romeo's love for your work and for mankind, if your laudable efforts are to be crowned with success. I am of the opinion that victory will obtain, and my services and my best wishes are at your command in your crusade, though lamentably belated, against the ignorance and inefficiency prevailing at present among many assigned by the surgeon to fulfill so important a mission as that of administering an inhalation anesthetic.

DRAWBACK TO DEVELOPMENT OF ANESTHESIA

Many factors have operated in this country to prevent physicians from engaging in the specialty of anesthesia. The most note-worthy of the causes are:—

First.—That but little if any consideration has been extended, professionally speaking, to the physician assigned to administer the anesthetic; and the usual professional dignity accorded other assistants at operation being withheld him, the anesthetist felt that the operator would without hesitation call any one he could get, without previous notice, to administer the anesthetic, a physician, a medical student or a nurse—in fact any one, man or woman, who could pour ether or chloroform, to the stage of unconsciousness, relaxation or muscular paralysis; and having to call to his assistance one or more bystanders to hold the patient on the table during the procedure was but little if any concern to him.

Second.—The honorarium, or fee, heretofore paid the anesthetist for his services and assistance, has been disgracefully inadequate, and has been done in such a manner—in a manner somewhat like the average guest would tip a waiter, rarely, if ever with the deference and consideration that partners in other lines of endeavor share and disburse the income resulting from their combined efforts.

The general practitioner, whose services the surgeon can obtain for the asking, to administer an anesthetic from time to time, between his calls, is never a well qualified anesthetist. He discharges the duty as a personal favor to his friend, the surgeon, without hope of reward, or he performs the task for the five or ten dollars that he expects to receive and of which he is badly in need. No sooner than his income from general practice is sufficient to pay his office rent and his automobile upkeep he abandons the practice of doing a chore which he never loved to do, and which he was never competent to do, and it is well that steps are being taken to demonstrate to the profession and to the public that none should be permitted to administer an inhalation anesthetic without being properly prepared to successfully discharge such an important undertaking.

During my student days, and since entering the practice of my profession, I have witnessed a good many deaths upon the operating table,—deaths that were undoubtedly due to the effects of an inhalation anesthetic by the ignorant and inexperienced anesthetists who were drafted from the audience in same instances to administer the anesthetic.

PRELIMINARY MEDICATION.

For twenty years my work has been confined to the study and the practice of the art and science of surgery. The subject of anesthetics and of anesthesia have been given due consideration, and I will submit on this occasion not a resume of my clinical experience with the use of inhalation anesthetics, but the method which that experience justified me in adopting in practice and in employing at this time. How the patient should be prepared for operation is of supreme importance, but it is not

apropos that the same should be discussed at this time by the speaker.

Preliminary Synergistic Medication should be employed regardless of the nature of the case requiring the administration of an inhalation anesthetic. It is in the short and minor cases, where such a large per cent of catastrophies and deaths occur, due largely, if not altogether to the fact that the unthinking and those without proper consideration for the patient's welfare, whether surgeon or dentist, consider the operation of insufficient importance to protect the patient against avoidable disaster by the use of synergistic drugs prior to giving the anesthetic. Verily, I believe, that gas-oxygen, properly mixed and administered by an expert can not and does not produce death, *per se,* during the performance of a short operation, or a long operation. Dentists, all of them, I fear, and many nose and throat men, rarely prepare their patients properly for the taking of an inhalation anesthetic.

Fright, with the adult expecting to undergo an operation, is an element practically ever present, and that element in many cases is a serious complication, and is one that can be and should be eradicated before the administration of the anesthetic is begun, and that can be done in one hundred per cent. of cases by the judicious employment of synergistic drugs and selecting a competent anesthetist to administer the anesthetic.

The anesthetist should be selected because of recognized ability and aptitude for the work he is assigned to perform; and he should be required to meet the patient before the time has arrived for placing the cone over the nose and mouth. I deplore the practice in vogue with some operators and in many of our hospitals, where the anesthetist is employed like the *engineer* or the *cook* at so much per week, rather than by the preferred method, which method I trust will soon become universal, *pay by the piece.*

The drugs that I have found most potent for good and most satisfactory in every way are, morphin, atropin, and magnesium sulphate. There are also other drugs that exercise, when given, an influence for good. Atropin enjoys the distinction of being both synergistic and antagonistic to morphin. It is the most reliable and the most powerful of the respiratory stimulants, counteracting completely the depressing effect of morphin upon the respiratory center; its analgesic properties are positive and as an anhydrotic it has no equal. It is the ultimath rule of the Pharmacopea. Scopolamin or hyoscin, is synergistic as an analgesic and as a respiratory depressant to morphin; that it is at times responsible for the development of alarming conditions and occasionally a death, is my belief—deaths that could have been avoided and would have been avoided had atropin been used instead of scopolamin.

Scopolamin is chemically and physiologically identical with hyoscin, a drug that is too powerful a respiratory depressant to be used, especially in combination with morphin, except in rare cases possibly, in small doses and with most careful watching of the respiration during and after the administration of the anesthetic. Since atropin possesses all the good qualities of scopolamin and none of its bad ones, I shall register my vote against the very frequent use of the combination morphin and scopolamin as synergistic drugs to an inhalation anesthetic.

Magnesium sulphate.—Gwathmey called our attention to the advantage of employing magnesium sulphate as a synergist to the inhalation anesthetics, in August, 1921. Since the publication of his article, in the *Annals of Surgery,* on that subject, I have used it as a routine in all my work, except when operating in some out-of-the-way place and in emergencies, where I did not have time to wait for the druggist to prepare the solution, as the solution should be carefully and freshly made. Magnesium sulphate is a very effective analgesic. It is an antispasmodic, and a motor depressant. Our experience with its use confirms Gwathney's statement—*that the analgesic effect of morphin dissolved in a solution of magnesium sulphate almost constantly and greatly prolongs the analgesic effect of the morphin.*

It does not produce sufficient cardiac or respiratory depression to be of practical consequence. In no instance has a patient entered the operating room, where our method of employing the synergistic drugs has been carried out, in a panicy or frightened condition, objecting to the anesthetic, or apprehensive concerning the immediate effect of same.

Gas-oxygen is employed in all of my work except in the very young. It is administered by an accomplished anesthetist, and it has been a long time since it was necessary to conduct a patient to the stage of pronounced unconsciousness with complete relaxation or muscular paralysis. The effect of the synergistic drugs previously given plus the liberal use of novocain along the line of incision has sufficed. *Novocain is of immense value, it is practically non-toxic, and by its use the surgeon can begin with the operation and perform it painlessly with the patient remote from the danger zone.* The surgeon, who insists upon relaxation to the degree of flaccidity,

and does not use local, will never enjoy the supreme satisfaction of knowing at all times that his patient is free from anesthetic risk, and, since no anesthetic is entirely free from risk, when carried to the stage of muscular paralysis, it is as well perhaps for such a surgeon to remain joined to his idols, and select almost any one to pour ether. Ether being less dangerous and more satisfactory than nitrous oxid-oxygen, *if the latter is used without synergistic therapy and local anesthesia.* It is my policy to operate under the lightest anesthesia possible, compatible with my ability to perform the operation; the lighter the anesthetic the less trauma inflicted upon the patient by the surgeon; and the less the trauma sustained by the tissues and viscera, the less the shock and the better for the patient. Undue haste is not possible under gas-oxygen analgesia, and undue haste is rarely necessary because of danger incident to the gas-oxygen inhalation anesthetic. Keep the patient warm and the chest properly protected during and immediately after the operation. The atropin will keep the patient dry, and fatalities due to the anesthetic alone will be extremely rare, if indeed they ever occur.

I am sure that anesthetists often get the blame for an occasional death when some other cause was responsible. *Bunglesome, slow, incompetent surgeons, unnecessarily rough handling of the tissues and traction upon viscera, chronic surgery, if practiced upon a patient under the influence of chloroform or ether, has claimed its toll.*

In the interest of the patient, and in the interest of synergistic analgesia as well as in the interest of your band of noble workers in this line of endeavor, I would, if asked my opinion, advise that you decline to reflect upon yourselves and upon your specialty and upon the safest and the least unpleasant of all inhalation anesthetics, gas-oxygen, by refusing to attempt to administer gas-oxygen to a patient for a surgeon to operate, who steadfastly refuses to receive the word, and to have properly selected synergistic drugs given his patient at a proper time before the hour set for operation.

CONCLUSIONS.

In my experience gas-oxygen *alone* is not a safe or satisfactory anesthetic, and those familiar with its use would not think of using it without the aid of synergistic drugs and the liberal use of novocain along the line of incision. The result of our experience in a large number of cases has been such as to warrant submitting to this Association the following conclusions:—

1. We feel that we have minimized the risk of the inhalation anesthetic to the greatest extent possible at the present time, when we shall have selected gas-oxygen as the inhalation anesthetic; and that we have obviated all preventable discomfort incident to the operation when we shall have ordered administered 3/8 of a grain of morphin, divided into three portions given at 20-minute intervals, with the second dose from 1/100 to 1/150 of a grain of atropin, each dose dissolved in from two to four c.c. of a freshly prepared twenty-five per cent. solution of magnesium sulphate, bacteria free in sterile normal salt solution. The administration of the first dose one hour and a half before the time set for the operation.

2. My last contribution to the literature on this subject was May 18, 1922. At that time I was not prepared to state that the large volume of magnesium sulphate first suggested by Gwathney could be safely dispensed with. Continued use of the twenty-five per cent. solution, in a large number of cases enables me to report that the analgesic effect of the morphin is prolonged with equal certainty and success, as it is when supplemented by the subcutaneous use of the four hundred c.c. of a four per cent. solution.

3. We now rely entirely upon the administration of three small doses of morphin with atropin, the second dose being dissolved in the twenty-five per cent. solution of magnesium sulphate, and can confidently recommend the procedure and the drugs as being simple, safe and successful.

4. The patient is neither frightened nor apprehension concerning the operation or its outcome.

5. The stage of induction is greatly shortened and there is rarely a period of excitement.

6. Forty per cent. of the patients thus prepared did not require an analgesic after operation.

7. The appetite returned earlier in patients operated upon when magnesium sulphate had been employed, because of the absence of pain and restlessness incident to the trauma inflicted at operation.

8. The patient remained pink throughout the operation, the pulse rate rarely exceeded 90, generally varying from 80 to 84.

9. The record of the nurse and bedside notes, show that synergized patients go on an average four times as long after an operation before an analgesic is required than patients who were given morphin dissolved in sterile water alone.

10. The use of novocain, along the line of incision, enables the surgeon to proceed with the operation earlier than he would be able to do otherwise, and without compelling the patient to be conducted to the

danger zone, *that is,* complete unconsciousness, complete relaxation, complete muscular paralysis, an unsafe condition,—a condition which should never be approached if the operation can be successfully prosecuted without so doing.

11. The surgeon and anesthetist co-operating, the anesthetist is able to withdraw the gas before the completion of the operation, and to administer oxygen alone so that the remaining sutures can be inserted and the dressings applied simultaneously with return of the patient to consciousness, or just as the patient emerges from the anesthetic.

12. Less of the inhalation anesthetic is required in cases in which synergistic therapy has been employed. Less nitrous oxid is required and a higher per cent. of oxygen can be used than in cases when the morphin is given in sterile water.

13. A general analgesic state obtains and synergized patients go on an average of fifteen hours without calling for something to relieve pain, compared to the free-pain interval of only four hours with patients operated upon when magnesium sulphate had not been used with the morphine before the operation.

14. The plan described is not difficult to execute but can not be used without success in all cases in the absence of proper co-operation between the surgeon and all those participating in the preparation of the patient for operation, as well as the anesthetist.

15. Fifty per cent. of our cases required no ether. In fifty per cent. of cases a small amount of ether was given. The amount varied from one drachm to one ounce. In fifty per cent. of cases, during the performance of an operation when a certain stage is reached, the use of a small amount of ether is advantageous, and when its use is indicated my anesthetist, without advice from me, administers it. We have found that gall bladder cases, common duct cases, and stomach cases, demand it more often than other types of abdominal operations.

16. Where the preparation of the patient for operation includes synergistic drugs, such as morphin, atropin and magnesium sulphate, it is hazardous to conduct the patient to the stage of profound unconsciousness, relaxation of muscular paralysis with the inhalation anesthetic. Patients thoroughly prepared under synergistic therapy can and should be operated upon under analgesia, not under profound anesthesia. The patient must be carried lightly to be carried safely. No inhalation anesthetic is a respiratory stimulant if administered to the stage of unconsciousness and general anesthesia. Should the surgeon demand unconsciousness and complete non-

resistance upon the part of the patient's tissues dur-
analgesia; nor should he employ eynergistic therapy.
analgesia; nor should he employ synergistic therapy. Ether is then the best and safest agent for him to use.

THE PROBLEM OF SERVICE IN THE RELATIONS OF THE PROFESSIONAL ANESTHETIST TO THE SURGEON.*

ANSEL M. CAINE, M.D.,

It was with great pleasure that I accepted the honor of the chairmanship of this, the organization meeting of the Southern Anesthetists. It is a step forward when we, who are devoting our entire time and assets to anesthesia, and those friendly to the cause and vitally interested, should be associated, as a section of our great commonwealth, with the other sections that are organized and are doing things in anesthesia. These meetings are the melting pots into which we pour our bits of experience, and out of which we can draw perfected methods and knowledge that will be of benefit to the people whom we serve, and who depend on us for the best.

In thinking over the problems of the anesthetist in order to find, if possible, a subject of vital interest to all, and one yet unsolved, I have chosen a subject, which touches on the life of the full time anesthetist, and in which the whole profession is interested and the welfare of the public of concerned. When it is fully solved all other problems will, to a large extent, disappear.

PROBLEMS.

Three great problems face the professional anesthetist today from a business standpoint:—

1. The nurse anesthetist and the hospitals.
2. The nurse anesthetist and the surgeon.
3. The problem of service.

The future progress of anesthesia is tied up in, and goes hand in hand with their solution. What concerns the future of anesthesia vitally concerns the surgeon and the public. Advances in anesthesia are dependent on professional men and not on nurses, so better anesthesia for the future is at stake.

By the *first problem* we mean the position taken by some of the leading hospitals of the country in employing nurses at a salary to do the anesthetic work of the institution, the hospital charg-

*President's Address presented during the Organization Meeting of the Southern Association of Anesthetists, Read House, Chattanooga, Tenn., November 14-16, 1922.

ing either a fixed or variable fee for each anesthetic, thereby making considerable money for itself. Other hospitals have a head anesthetist who is a physician, and all work that he can not do himself is done by nurses in the employ of the hospital. The head anesthetist may or may not be on a salary. These hospitals bring pressure to bear on the visiting surgeons to induce them to use the hospital anesthetist, so that, in order to get the best service from the hospital, the surgeon hesitates to recommend the service of an outside professional anesthetist, and sometimes discourages it. This condition was brought about by the lack of skill of the residents in the anesthetic work, as well as their often lack of interest. Then too, many hospitals have been short of internes even to do all the other necessary work. To fill the need the hospitals turned to the ambitious nurse. This plan has now degenerated into a money making scheme in many instances, with every discouragement to the professional anesthetist.

The *second problem* involves the surgeon, or group who employ a nurse to do the anesthetic work. Usually she is on a salary, and is office nurse during office hours. For her services either a flat or variable charge is made. The question of money is involved with the surgeon or group who figure that if they break even they will have secured the service of an office nurse free. Often considerably more is made if the surgeon or group are busy. Needless to say that they always insist on their own nurse administering the anesthetic, even when the patient requests the service of a professional. The surgeon assumes the responsibility of the administration of the anesthetic. The nurse can not be blamed, for often she does enough work, apart from the administration of his anesthetics, to earn her salary, and, legally, she is without responsibility. Under these conditions it seems that the surgeon has no conscience in the matter when he steals or sidetracks a patient, desirous of the service of some competent physician as anesthetist, from a professional associate for his nurse. Other men employ a certain nurse without a salary. In return for her faithfulness in always being on hand when called, they insist that all their patients use her as anesthetist. In fact the patient has no voice in the matter at all with some of these operators, and it matters not how good the professional is, he will not be used. Such operators bring every argument to oppose in favor of their nurse. With these men there is no money involved but *service*. But the longer one lives and observes men and women and life in various phases, the more one is impressed with the truth of the scripture which says *"The love of money is a root of all evil"*. Since every deliberate act is the expression of the sum of complex motives, not all of which are weighed separately, it can be readily seen and understood how a perfectly honest man, a man above reproach morally, can be influenced to do things that are not always for the best.

If surgeons, who look on anesthesia in the light of those alluded to, predominate in a community, it is utterly impossible for a professional anesthetist to build a practice for himself. It matters not how good he is, or how much he endeavors to advance his specialty, his efforts will be worth little so far as his popularity goes.

The *last problem,* the lack of solution of which has brought on the second, and which is partially responsible for the first, is the problem of *service*—efficient, consistent and persistent service. The busy surgeon's stock in trade (ability being understood) is time. His routine must be adhered to if he would live in partial peace. Delays break him all up by upsetting his routine. If he is delayed 15 minutes to an hour during the day, he never catches up. It causes others like delays too, the sum of which is likely to be several hours lost. He is hurried and out of humor trying to catch up. It is in the effort to curtail these delays that he has been led to employ nursing anesthesia rather than the professional anesthetist. There have been too few professionals and not enough efficiency in the occasional anesthetist. The surgeon usually wants the best for his patient because he realizes that what is best for his patient is best for him. The few dollars involved will not influence the patient or the surgeon, as a rule, if safety is the stake. Hence the surgeon tries for the professional but his service is limited. It is impossible for him to be at all cases at the same time because there are too few professional anesthetists. He then tries the young graduate just out of school or hospital. This often proves unsatisfactory to him for one or two or both reasons,—*first,* the tyro's mind is on building up a practice for himself and not on anesthesia; and, *second,* his training is not always sufficient to make him an efficient anesthetist in all lines. The surgeon then turns to the nurse, who has taken some instruction in anesthesia

somewhere. He claims to find in her a better anesthetist than the occasional physician anesthetist. She causes him no delays, and is willing to do other things in the way of helping in his office. She usually can be had for a salary which will give her as much or more than she can make doing 12 to 24 hours duty; the hours are shorter and the diversion greater. In all fairness I have tried to state the surgeon's side in this matter. and in truth have tried to show what it has degenerated to in some instances.

The Solution.

So the solution of the business problems of the anesthetist, as I see it, centers in the solution of the problem of service. This can be accomplished by putting more trained and skilled men and women of the profession into the field, and by perfecting co-operation among those already in the specialty. The training can be accomplished in three ways—

1. Better courses in the schools.
2. Better courses in the hospitals.
3. A process of selection among the internes, giving those who like anesthesia special work during the time they are in the hospital in all lines of anesthesia, both in theory and practice. In this way the importance of this branch of the practice of medicine will be impressed on the coming surgeons and internists, and enough skilled anesthetists will be developed.

The older and established anesthetists can encourage the men who want to take up anesthesia by helping in their problems, and referring the overflow cases that comes to them to these younger men. Professional jealousy has no place in co-operative service in anesthesia. Other work can be done until it becomes necessary to lop it off as the anesthetic work increases. In this I agree with Salzer. The surgeon should realize that his co-operation is essential to anesthetic advances, and, if a busy man, he should have a real live progressive professional anesthetist as a member of his team. It is possible for every man to be well served in this way to his own advantage and to the advantage of his patients, and with but little additional cost. This item will be gladly borne if the patient realizes he is getting the best service obtainable, and especially a service that is responsible in the eyes of the law. Conscientious anesthetists always are willing to co-operate in the matter of charges.

What is needed to stimulate more men to perfect themselves in anesthesia is encouragement from surgeons. One hesitates to devote much time to a line of work when the men for whom he hopes to work look upon the nurse as his equal in that field, and who discourage all their patients from securing the service of a specialist to anesthetise them, even when the patients expresses that desire.

The first problem, or the hospital problem, is one the anesthetist *alone* can not solve. It is merely one phase of the problem of hospital domination of the medical profession which is on the increase and which, at full fruition, means socialized medicine. The profession as a whole is most vitally interested in this and must not remain asleep too long.

1640 Robert St.

Book Reviews

Regional Anesthesia. By Gaston Labat, M.D., New York City. With a Foreword by Wm. J. Mayo, M.D., Rochester, Minn. Publishers: W. B. Saunders Co., Philadelphia and London, 1922.

In his foreword Mayo says that regional anesthesia has come to stay. One of the reasons for the delay in general acknowledgment of its great value is incident to the exaggerated claims made for it. It is especially indicated in cases of acute sepsis, and the young surgeon should perfect himself in its use. Mayo does not look forward to the day when regional anesthesia will wholly displace general anesthesia, but recognizes its great value. Labat holds that regional anesthesia fulfils the best conditions hitherto offered for the accomplishment of the most delicate and elaborate surgical procedure.

In its proper application experience is absolutely needful. Such experience can be acquired rapidly only by practice, and only provided the one seeking this experience knows what to do and how to do it. This book has been written for the purpose of teaching these things. Labat states that to accomplish regional anesthesia adequate instruments are absolutely needful. He has studied the different segments of the body from the view-point of the anesthetist, and precedes each technical description with a review of the anatomy of the region, with special reference to nerve distribution. His descriptions are most helpfully illustrated. There are special chapters devoted to the nose, eye, ear, and genito-urinary organs. A special chapter is devoted to Spinal Anesthesia, the technic of intraspinal block, novocainization being the only one described. He warns the inexpert against expecting complete success with his first efforts.

The author describes regional anesthesia as the result of a certain number of delicate surgical procedures by which it is possible to control pain temporarily by interrupting the sensory nerve conductivity of any region of the body. Motor function is occasionally interfered with.

Regional anesthesia is best realized by injecting an anesthetic solution in the immediate vicinity of the nerves supplying the operative field. It is commonly called local anesthesia; but it differs from local anesthesia in that the anesthetic fluid is never injected along the line of incision or within the structures of the surgical wound. Local injections, however, are frequently of great help to the regional method, which it completes in case of partial failure to block one or more of the nerves supplying the region.

(*Continued on page* 93)

American Journal of Surgery

QUARTERLY SUPPLEMENT *of* ANESTHESIA *and* ANALGESIA

Surgery Publishing Co.

Established by J. MacDONALD, Jr., M.D.

15 EAST 26TH STREET - NEW YORK, U. S. A.

Original Articles, Clinical Reports and Experimental Researches on the Theory and Practice of Anesthesia and Analgesia, as well as pertinent Society Transactions, are solicited for exclusive publication in this Supplement. Typewritten Manuscripts facilitate Editorial Revision and avoid errors.

Subscribers Changing Address should immediately notify the publishers of their past and present locations.

Half-tones, Line-etchings and other Illustrations will be furnished by the Publishers when Photographs or Drawings are supplied by the Author.

F. HOEFFER McMECHAN, A.M., M.D., *Editor*
Avon Lake, Ohio, U.S.A.

JULY EDITORIALS 1923

THE HEART IN SURGERY.

There is an ancient adage, which still passes currency among the laity in relation to surgical operations to the effect that "the operation was a success but the patient died." When sprung upon a medical man he is expected to respond with a self-deprecatory smile, but in his heart and in his experience he knows that the statement contained in the words is not a joke at all, but a tragic truth, borne out in many unfortunate surgical cases. The operation, as a matter of fact, so far as the surgical judgment and the technical skill of the operator is concerned, is a success, yet the patient dies because at the time of operation he or she was a surgical bankrupt, unable to withstand the stress of the occasion.

One of the most frequent and serious factors in this surgical bankruptcy is an inadequate heart. And this is not surprising when one considers that the strain and shock of operation falls foremost and heaviest upon the cardio-vascular mechanism. Aside from sepsis, by far the largest proportion of patients who die as a result of surgical operation die of circulatory failure; and even among the cases in which sepsis is written on the death certificate, we must concede a fair percentage attributable, as "primary cause," to failure of the heart—that is to say, the patient would no doubt have survived the toxemia, as in pneumonia, if the heart had been adequate.

It goes without saying, of course, that every patient in whom there is an existing, definite heart lesion, or even a grave functional disturbance of the heart, is a bad surgical risk, and gives grave concern to the physician and surgeon in the face of a major operation, with its anesthetic and operative shock. Not infrequently, operation which is badly needed has to be denied these patients, because the chances of death from circulatory failure under surgery outweigh the chances of recovery. And there is still another group of cases, in which no definite pathology of the heart is present, but where the outlying reno-vascular conditions are such as to make the cardiac prospects in a major operation exceedingly precarious.

All cases of this kind, included in both the groups referred to, offer a conspicuous field for co-operation between the surgeon and physician. It is not a time or a place to throw up the hands in hopeless inactivity. In many such cases, a careful and judicious course of pre-operative preparation will not only change the face of the prospect, but actually reverse the patient's chances, and turn a bad risk into a good one. By improving the tone and output of the heart, relaxing the tense arterioles, and promoting the renal function, in short, by establishing a good circulatory compensation, many heart patients for whom a surgical operation seemed to be hopelessly out of the question may be brought into a condition to successfully meet the emergency.

There is yet another class of surgical patients in whom the cardiac complication is a post-operative, instead of a pre-operative, factor. There is nothing apparent, either before or at the time of operation, to make one suspect that the heart will give trouble, but the stress and shock of the operation itself, added to other physical conditions, seem to break the patient's circulatory compensation, and a condition supervenes which is analogous to that of decompensation in a diseased heart, accompanied often by arteriole spasm and oliguria, which, of course, create a vicious circle of funtional pathology.

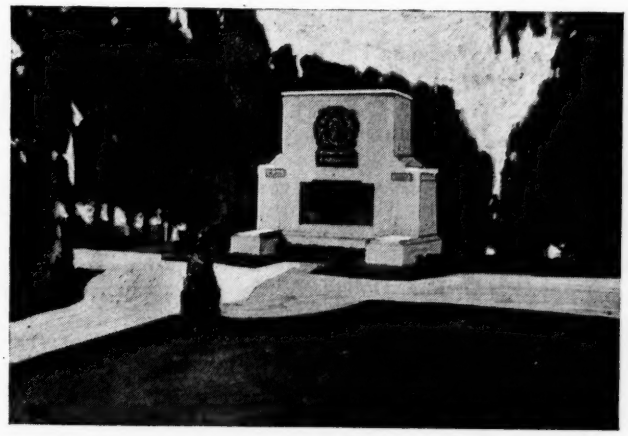
In cases of this latter kind, again, the problem is one for the internist, largely irrespective of the purely surgical elements in the case. He is dealing, in fact, with cardiac decompensation; and it calls for the same treatment that would be given to a non-surgical decompensation. By prompt and judicious measures directed toward restoring the cardio-vascular balance, the threatening aspects of the case will often disappear, and apparent failure be turned into success.

The important points here emphasized are (1) that the heart and the circulatory mechanism constitute one of the most common and serious factors in surgical banyruptcy, both pre-operative and post-opera-

tive, demanding the most assiduous precautions on the part of the physician, and (2) that in dealing with such cases the surgical element should not be permitted to eclipse the medical considerations of a condition which is essentially cardio-vascular, and amenable to the same treatment as a similar non-surgical condition.—*Heartology.*

MORE HONORS FOR MORTON.

In recent years there has been a most commendable trend on the part of the public as well as the profession to honor those, who in any way have materially aided in the relief of suffering humanity. This is in pleasing contrast to the monuments to those who have caused the death of untold numbers through war.



The proposed Morton Memorial and a close-up of the *Hygiene.*

On Labor Day, 1923, Dr. Alonzo A. Bemis, Secretary of the Memorial Committee, hopes to be able to unveil a monument to Dr. William T. Morton, in recognition of his public demonstration of the possibilities of ether anesthesia, and his association with the community of Spencer, Mass. Reproductions of this monument show that it will be a very fitting and artistic memorial.

Those who attended the Second Annual Meeting of Canadian Society of Anesthetists at Winnipeg, were shown among the names of the greatest celebrities in medical discovery and research, carved on a stone coping around the building of the new Medical School, that of Morton, and quite fittingly it was the most conspicuous because it was immediately above the entrance.

Book Reviews

(*Continued from page* 91)

Regional anesthesia may be produced by the use of two different types of procedures: (1) Field-block; (2) nerve-block. Field-block consists in creating walls of anesthesia encircling the operative field. The solution is distributed fanwise in certain definite planes of the body, so as to soak all the nerves crossing these planes on their way to the operative area. Sometimes one single wall blocks the desired area.

Nerve-block consists in making extraneural or paraneural injections in close proximity to the nerves whose conductivity it is desired to cut off. When the solution is injected close to the spinal column at the emergence of the nerve trunks from the intervertebral foramina, it constitutes "paravertebral block." Blocking the nerve trunks through the posterior sacral foramina is defined as "transsacral block." Injecting the sacral nerves on the anterior aspect of the sacrum is termed "presacral block." Blocking the nerve trunks within the spine, but outside the dura mater, is called "epidural, extradural, or caudal block." Blocking the roots of the nerves within the spine, in the subarachnoid space, constitutes "intraspinal block," by which spinal anesthesia is realized.

He lays down the following rules as fundamental:

As soon as the patient is on the operating table the assistants should make sure that he feels comfortable and see that he is not held thereon with to much restraint. The discomfort due to position is often an ordeal greater than the operation itself.

When preparing the operative field gentleness should be used, and care exercised in clamping the towels, not to clamp the skin beyond the limits of the anesthetized area. The non-observance of this precaution is followed by constant groaning, which leads the inexperienced surgeon to believe that there is operative pain.

The patient should not be told when the operation begins.

Incisions should be made a little longer than when using general anesthesia, thus exposing more freely the deeper layers and reducing trauma.

Sharp instruments should be used; cutting with the scalpel should be preferred to snipping with the scissors.

On no account should the tissues be torn through or bruised by rough handling with fingers or blunt instruments; sharp dissectors make better technicians.

Retractors should be introduced lightly and opened out gradually. Pulling a retractor with such force as would drag the patient off the operating table, had he not been tightly fastened thereon, should not be allowed.

The hand should not be forced through an insufficient opening of the abdominal cavity and the gloved hand allowed rough contact with the visceral and parietal peritoneum, thus causing pain and creating favorable conditions for future adhesions.

Pulls on the tissues, more particularly on the viscera, should be light and gradual, so as not to give rise to unpleasant sensations referred to the tissues beyond the anesthetized area.

Extensive packing in the abdominal cavity should be avoided. In the Trendelenburg position the bowels have a tendency to collect in the upper abdomen. The surgeon should avail himself of this advantage. Too heavy packing is painful, and always attended by an involuntary reaction which causes the bowels to protrude from the wound; whereupon the surgeon attempts to reestablish continence by further packing, which in turn results in more marked natural reaction on the part of the patient, and thus a vicious circle is created. To overcome this state of things general anesthesia must be resorted to and the patient loses the benefit of the regional method. But if at the start, before entering the abdominal cavity, the table is inclined full angle one way or the other, or tilted on either side, and the patient asked to breathe naturally through the mouth, protection of the abdominal cavity can be realized, with almost no discomfort to the patient, after gently and gradually retracting the wound wide open.

The patient should not be questioned on the degree of sensibility of the operative field, unless it be necessary to control the results of an anesthetic procedure under experiment. But even then better information may be had by watching the patient's face, whose expression is, as a rule, most reliable. If there is actual pain, reactions will always coincide with painful stimuli. Groaning or moaning may be due to discomfort on the operating table, or to a nauseated condition frequently present in the Trendelenburg position or when handling the abdominal viscera, especially the stomach. This condition ordinarily disappears by deep breathing. It is necessary to make sure that the surgical act is really painful before general anesthesia is resorted to; and this is where the surgeon's experience of the method will help him control the patient's attitude, which might be simply psychologic. In no case, however, should a patient be left groaning or moaning and encouraged only by such words as "I am nearly through," "You are doing fine," "Just a minute," and so forth, when long, painful manipulations have still to be done. Whatever be the condition under which he is laboring, a few whiffs of ether or gas-oxygen should be given to calm him; otherwise he leaves the operating room with an extremely bad recollection of his operation. On the other hand, it is not a shame for a surgeon to combine regional anesthesia with a first-class narcosis if sensibility to pain has not been completely abolished, or if there is lack of co-operation on the part of the patient. He should first look to the welfare of the patient for which the method of regional anesthesia has been devised, and do his utmost to help him through the operation. If something goes wrong, it is proof that the technic used is at fault. Any condition resulting from such faulty technic should be remedied at once.

On no account should manipulations go beyond the anesthetized area; if they are deemed necessary, supplementary injections should be made, or a first-stage narcosis resorted to, before attempting such manipulation; and in case there is pain, time should always be allowed for the patient to lose consciousness before painful maneuvers are resumed. Even then no rough handling should be allowed.

Surgeons and assistants should not lean on the patient or against his fastened arms during the operation. Leaning on the patient's legs in the perineal position is extremely painful. Continued pressure on the thorax is detrimental to good breathing.

All operations should be started from five to ten minutes after the anesthesia has been completed, except when using caudal block alone, in which case it will be necessary to wait from twenty to thirty minutes.

An hour and a half is the average duration of surgical anesthesia; after which other injections should be made or general anesthesia administered as soon as the patient begins to feel pain. The operation should be suspended for a while and resumed only when anesthesia has set in.

There follow rules of conduct toward the patient, methods by which his attitude may be such as to be co-operative, these including the preoperative psychic control and that during the process of operation and thereafter. The author describes and illustrates the instruments used, expresses a preference for novocain, and gives the solutions of choice and the indications for the use of each.

The second chapter is devoted to the principles of technic; thereafter follow cranial headings, blocking of cranial nerves, operations on the head, blocking of spinal nerves; operations on the neck, on the upper extremities, on the thorax; operations on the abdomen; genito-urinary and rectal operations; operations on the lower extremities; intraspinal block injection (spinal anesthesia); a general discussion of the value of regional anesthesia.

This is the most practical and instructive book yet written on this topic. He who has a belief in the safety and efficacy of this method, has a sound medical education, and is willing to refresh his memory of anatomy by cadaveric work, can become by the aid of this single book sufficiently expert in regional anesthesia to make it practicable in the vast majority of his operations.

Quarterly Index

ACETYLENE, PURE, ANESTHESIA WITH. C. J. Gauss and H Wieland, Klinische Wochenschrift, January 15 and 22, 1923.

ALKALI THERAPY, SOME LIMITATIONS OF. Editorial. Journal American Medical Association, March 17, 1923.

ANALGESIA, SYNERGISTIC, FURTHER EXPERIENCES WITH. G T. Tyler, Jr., Greenville, S. C. Southern Medical Journal, March, 1923.

ANESTHESIA AND ANALGESIA FOR DYSTOCIA. C. Henry Davis, Milwaukee, Wis. Current Researches in Anesthesia and Analgesia, February, 1923.

ANESTHESIA, GENERAL, IN SUBMUCOUS AND OTHER OPERATIONS. J. G. Poe, Dallas, Texas. American Journal of Surgery, Anesthesia Supplement, April, 1923.

ANESTHESIA DEPARTMENT, ORGANIZATION OF A HOSPITAL. Caroline B. Palmer, San Francisco, Calif. Current Researches in Anesthesia and Analgesia, April, 1923; Hospital Buyer, May, 1923.

ANESTHESIA, PULSE AS A GUIDE TO. Garrett Hogg, Springfield, Mo. The Medical World, April, 1923.

ANESTHESIAS IN A SMALL HOSPITAL, REPORT OF A SERIES OF. H. G. Stetson, Greenfield, Mass Boston Medical and Surgical Journal, March 29, 1923

ANESTHESIA AS A PART-TIME SPECIALTY. Moses Salzer, Cincinnati. American Journal of Surgery, Anesthesia Supplement, April, 1923.

ANESTHETIC VAPOR, DIFFERENT EFFECTS PRODUCED BY EXPOSING TISSUES TO VARIOUS CONCENTRATIONS OF. A. L. Flemming, Bristol, England. Current Researches in Anesthesia and Analgesia, February, 1923.

ANESTHETIST, THE, ON THE HOSPITAL STAFF. Charles H. Sanford, New York. American Journal of Surgery, Anesthesia Supplement, April, 1923.

BLOOD PRESSURE, SOME MODERN VIEWS ON. F. A. Faught, Philadelphia. Journal of the Medical Society of New Jersey, March, 1923.

BLOOD PRESSURE DURING SURGICAL OPERATIONS UNDER GENERAL ANESTHETICS. Morris H. Clark, Kansas City, Mo. American Journal of Surgery, Anesthesia Supplement, April, 1923.

BREATH HOLDING TEST AS A SAFETY-FIRST FACTOR IN DETERMINING SURGICAL RISK AND OXYGEN NEED UNDER ANESTHESIA. W. I. Jones, Columbus, Ohio. Current Researches in Anesthesia and Analgesia, February, 1923.

CAFFEIN INTRAVENOUSLY, THE BEST OF STIMULATES. W. W. Duke, Kansas City, Mo. Journal American Medical Association, April 7, 1923.

CHLOROFORM ANESTHESIA FOR ASTHMA. W. B. Rogers, White Sulphur Springs, Montana. The Medical World, April, 1923.

CIRCULATORY CHANGES DURING ANESTHESIA. John R. Worley, Dallas, Texas. American Journal of Surgery, Anesthesia Supplement, April, 1923.

CIRCULATORY CONDITIONS, CERTAIN, THE REACTION OF, TO ANESTHESIA AND SURGERY. E. I. McKesson, Toledo, Ohio. Current Researches in Anesthesia and Analgesia, April, 1923.

DEATHS—FATALITY AFTER LOCAL ANESTHESIA. R. Eidens. Archiv für klinische Chirurgie, January 27, 1923.

DEATHS—FATALITIES FOLLOWING MINOR OPERATIONS UPON THE NOSE AND THROAT. Editorial. Southern Medical Journal, April, 1923.

DEATHS—THE MORTALITY RATE FOLLOWING OPERATIONS ON THE THYROID GLAND. Charles H. Mayo and Walter M. Boothby, Rochester, Minn. Journal American Medical Association, March 31, 1923.

ETHER, THE ACTION OF, ON THE CIRCULATION IN TRAUMATIC SHOCK. McKeen Cattell, Boston. Archives of Surgery, January, 1923.

ETHER ANESTHESIA, THE PROPER DEPTH OF. F. R. Widdowson, Philadelphia. The Atlantic Medical Journal, April, 1923.

ETHER ANESTHESIA, DOUBLE MASK FOR. Jatrou and Wesseley. Zentralblatt für Chirurgie, January 27, 1923.

ETHER ANESTHESIA, FACTORS INFLUENCING THE SAFETY OF. R. M. Waters, Sioux City, Iowa. Nebraska State Medical Journal, April, 1923.

ETHER, ETHYL, ACCURATE METHOD OF DETERMINING SMALL AMOUNTS OF, IN AIR, BLOOD AND OTHER FLUIDS, TOGETHER WITH A DETERMINATION OF COEFFICIENT OF DISTRIBUTION OF ETHER BETWEEN AIR AND BLOOD AT VARIOUS TEMPERATURES. H. W. Haggard, New Haven. Journal of Biological Chemistry, February, 1933.

ETHER, ELIMINATION OF IN BLOOD, MILK, URINE AND BREATH AFTER ANESTHESIA. Karl Gramen, Acta Chirurgica Scandinavica, 1922, Supplement 1.

ETHER, INTRAPERITONEAL INJECTIONS OF. H. Naujocks, Monatsschrift für Geb. und Gynäkologie, October, 1922.

ETHER, TREATMENT OF PERITONITIS WITH. C. Steida. Deutsche medizinische Wochenschrift, December 29, 1922.

ETHER ANESTHESIA, STUDY OF ISO-AGGLOUTININS BEFORE AND AFTER ETHER ANESTHESIA. John G. Huck, Baltimore. Journal American Medical Association, March 10, 1923.

ETHER, PURE, ANESTHETIC ACTION OF H. H. Dale, C. F. Hadfield and H. King. Lancet, March 3, 1923

ETHYL-CHLORID ANESTHESIA IN MINOR OPERATIONS. A PRELIMINARY REPORT ON. Louise A. Oldenbourg, Berkeley, Calif. Current Researches in Anesthesia and Analgesia, February, 1923.

ETHYL CHLORID FOR CHILDREN, DANGERS OF. Seifert. Deutsche medizinische Wochenschrift, January 12, 1923.

ETHYLENE, A NEW GAS ANESTHETIC, THE PHYSIOLOGICAL EFFECTS OF. A. B. Luckhardt and J. B. Carter, Chicago. Journal American Medical Association, March 17, 1923.

ETHYLENE AS AN ANESTHETIC. Editorial. Journal American Medical Association, April 7, 1923.

INTRATRACHEAL INSUFFLATION ANESTHESIA. Mary Kavanagh, San Francisco. American Journal of Surgery, Anesthesia Supplement, April, 1923.

LOCAL ANESTHESIA—BUTYN, A NEW LOCAL ANESTHETIC: A SUMMARY OF ABOUT 500 CASES. R. A. Griffith, Chicago. American Journal of Clinical Medicine, March, 1923.

LOCAL ANESTHESIA, CESAREAN SECTION UNDER. W. E. Mowery, Salina, Kansas. Medical Herald, April, 1923.

LOCAL AND GENERAL ANESTHESIA IN STRANGULATED HERNIA. E. P. Richardson. Boston Medical and Surgical Journal, March 29, 1923.

LOCAL ANESTHESIA—THE INJECTION TREATMENT OF HEMORRHOIDS. W. A. Hinckle, Peoria. Illinois Medical Journal, March, 1923.

HEART FUNCTION TEST, PULSE CHANGES AS. P. Holzer and E. Schilling. Zeitschrift für klinische Medizin, January 27, 1923.

LOCAL ANESTHESIA—EXTRAORAL ANESTHESIA OF THE MANDIBULAR NERVE. Chrapek. Zentralblatt für Chirurgie, January 27, 1923.

LOCAL ANESTHESIA—EXTRAORAL INJECTIONS. Mendel Nevin, Brooklyn, N. Y. Dental Items of Interest, March, April, 1923.

LOCAL ANESTHESIA—NERVE TRUNK ANESTHESIA IN DENTISTRY. S. C. Waite, Buffalo, N. Y. La Odontologia, December, 1922.

LOCAL ANESTHESIA—INFILTRATION ANESTHESIA IN A NUMBER OF TEETH IN THE SUPERIOR MAXILLA. Mendel Nevin, Brooklyn. Dental Items of Interest, May, 1923.

LOCAL ANESTHESIA—SURGICAL PREPARATION OF PROTRUDED MAXILLAE FOR RECEPTION OF ARTIFICIAL DENTURES. E. L. Aison, Chicago. Dental Cosmos, March, 1923.

LOCAL ANESTHESIA—INTRANASAL INJECTIONS OF ALCOHOL IN THE TREATMENT OF HYPERESTHETIC RHINITIS AND OTHER NASAL NEUROSES. O. J. Stein, Chicago. Annals of Otology, Rhinology and Laryngology, December, 1922.

LOCAL AND REGIONAL ANESTHESIA IN MAJOR SURGERY. W. I. Hume, Louisville. Kentucky Medical Journal, March, 1923.

LOCAL ANESTHESIA—COMMENT ON NERVE BLOCKING IN THE LEG. O. Wiedhopf. Zentralblatt für Chirurgie, December 30, 1922.

LOCAL ANESTHESIA, PRACTICAL APPLICATION OF, TO MAJOR SURGERY. R. E. Farr, Minneapolis. Minnesota Medicine, April, 1923.

LOCAL ANESTHESIA—UNEXPECTED EPINEPHRIN REACTION FOLLOWING INFILTRATION WITH PROCAIN-EPINEPHRIN SOLUTION AS A LOCAL ANESTHETIC. C. E. Dowman, Atlanta. Journal American Medical Association, April 14, 1923.

LOCAL ANESTHESIA—KAPPIS' SPLANCHNIC ANESTHESIA IN DIAGNOSIS. Kulenkampf. Zentralblatt für Chirurgie, February 10, 1923.

LOCAL ANESTHESIA—BLOCKING THE SPLANCHNIC NERVES. P. L. Mirizzi. Revista Medica del Rosario, November, December, 1922.

LOCAL ANESTHESIA—REGIONAL ANESTHESIA FOR ABDOMINAL OPERATIONS. F. v. d. Hütten. Beiträge zur klinischen Chirurgie, 1923, Vol. 128, No. 1.

LOCAL ANESTHESIA, SURGERY OF THE UPPER ABDOMEN UNDER. R. E. Farr, Minneapolis. Illinois Medical Journal, February, 1923.

LOCAL ANESTHESIA—THE USE OF PARAVERTEBRAL NERVE BLOCK ANESTHESIA IN GENERAL SURGERY. W. R. Meeker, Rochester. Minnesota Medicine, March, 1923.

LOCAL ANESTHESIA—REGIONAL ANESTHESIA OF THE NECK AND ARMS. Brunin and Vandeput. Archives Franco-Belges de Chirurgie, September, December, 1922.

LOCAL ANESTHESIA—REGIONAL ANESTHESIA OF THE UTERUS. G. Cotte. Presse Medicale, January 13, 1923.

LOCAL ANESTHESIA—FURTHER EXPERIENCES IN SACRAL ANESTHESIA IN UROLOGY. Albert J. Scholl, Jr. Rochester, Minn. Current Researches in Anesthesia and Analgesia, April, 1923.

LOCAL ANESTHESIA—SPASTIC ILEUS AND LUMBAR ANESTHESIA. A. Mayer. Zentralblatt für Chirurgie, December 23, 1923.

LOCAL ANESTHESIA—TECHNIC OF SPINAL ANALGESIA FOR LAPAROTOMY. S. A. Lane. Journal of Tropical Medicine and Hygiene, January 22, 1923.

LOCAL ANETHESIA—INTRASPINAL ANESTHESIA. R. Bloch and Hertz. Presse Medicale, February 7, 1923.

LOCAL ANESTHESIA—SPINAL ANESTHESIA FROM A STUDY OF ABOUT 15,000 INDUCTIONS. W. W. Babcock, Philadelphia. Pennsylvania Medical Journal, February, 1923.

LOCAL ANESTHESIA—SPINAL ANESTHESIA IN GYNECOLOGY. W. R. Cooke, Galveston. Texas State Journal of Medicine, March, 1923.

LOCAL ANESTHESIA FOR GOITER OPERATIONS. K. Urban. Zentralblatt für Chirurgie, January 20, 1923.

LOCAL ANESTHESIA, THYROIDECTOMY UNDER. Carroll W. Allen, New Orleans. Southern Medical Journal, May, 1923.

LOCAL ANESTHESIA, TONSILLECTOMY IN ADULTS UNDER. James J. King, New York. International Journal of Surgery, April, 1923.

MEDICO-LEGAL—DEATH OF CHILD FALLING FROM BED IN HOSPITAL AFTER AN OPERATION. Journal American Medical Association, March 17, 1923.

MORPHIN IN OBSTETRICS, USE OF. F. Hendrickson and A. R. Vonderahe, Cincinnati. Ohio State Medical Journal, March, 1923.

MORPHIN-HYOSCIN SEMI-NARCOSIS PRECEDING OPERATION, A REPORT OF 100 CASES WITH 50 CHECKS. C. D. O'Keefe, St. Louis. Missouri State Medical Journal, April, 1923.

NITROUS OXID-OXYGEN ANESTHESIA, BETTER. George F. Seeman, Nashville, Tenn. Current Researches in Anesthesia and Analgesia, February, 1923.

NITROUS OXID-OXYGEN ANESTHESIA, SOME UNUSUAL COMPLICATIONS OF. Ansel M. Caine, New Orleans. American Journal of Surgery, Anesthesia Supplement, April, 1923.

NITROUS OXID-OXYGEN-ETHER IN DENTISTRY. H. Howard Powers, Bay City, Mich. Current Researches in Anesthesia and Analgesia, April, 1923.

NITROUS OXID-OXYGEN AND ITS VALUE AS A GENERAL ANESTHETIC IN GENITO-URINARY SURGERY. J. J. Buettner, Syracuse. New York State Journal of Medicine, March, 1923.

NITROUS OXID, PHYSIOLOGICAL EFFECTS OF. N. C. Trew, Los Angeles. California State Journal of Medicine, February, 1923, and American Journal of Surgery, Anesthesia Supplement, April, 1923.

NITROUS OXID ANALGESIA IN LABOR. F. R. Pasman. Semana Medica, December 28, 1923.

NITROUS OXID-OXYGEN IN OBSTETRICS. A. E. Rives, East St. Louis. Illinois Medical Journal, March, 1923.

NITROUS OXID IN OBSTETRICS. John R. Worley, Dallas, Texas State Medical Journal, March, 1923.

NITROUS OXID-OXYGEN UNDER POSITIVE PRESSURE IN THRORACIC SURGERY. Edith H. Williams, San Francisco, Calif. Current Researches in Anesthesia and Analgesia, February, 1923.

NITROUS OXID-OXYGEN ANESTHESIA (WITHOUT ETHER) FOR TONSILLECTOMY IN THE RECUMBENT POSTURE: WITH A REPORT OF 1,022 CASES. John H. Evans, Buffalo, N. Y. Current Researches in Anesthesia and Analgesia, April, 1923.

OXYGEN BREATHING, BLOOD CHANGES IN. Full and Friedrich. Klinische Wochenschrift, January 8, 1923.

OXYGEN EXHAUSTION OF BLOOD AS A FACTOR IN FLIGHT LIMITATIONS. FURTHER OBSERVATIONS ON CARDIO-VASCULAR PHYSICAL FITNESS TEST. C. W. Greene and E. C. Schneider. Military Surgeon, January, 1923.

OXYGEN IN THE PERITONEAL CAVITY: WITH REPORT OF CASES. Wm. Seaman Bainbridge, New York. American Journal of Surgery, Anesthesia Supplement, April, 1923.

OXYGEN WITH CARBON DIOXID IN RESPIRATORY DEPRESSION AND ANOXEMIC DISEASE. J. R. McCurdy, Pittsburgh. The Atlantic Medical Journal, April, 1923.

OXYGEN AND CARBON DIOXID MEASUREMENT, OF TENSION OF IN BLOOD OF PULMONARY ARTERY IN MAN. A. C. Redfield, A. V. Block and J. C. Meakins. Journal of Physiology, December, 1922.

OXYGEN THERAPY IN PREMATURE BABIES WITH ANOXEMIA. H. Bakwin, New York. American Journal of Diseases of Children, February, 1923.

POST-OPERATIVE ABSCESS OF THE LUNG, A REPORT OF 12 CASES AND 2 CASES OF POST-OPERATIVE PNEUMONIA. H. L. Barnes, Wallum Lake. Rhode Island Medical Journal, March, 1923.

POST-OPERATIVE COMPLICATIONS—ABSCESS OF LUNG AND METHOD OF PREVENTION IN NASOPHARYNGEAL SURGERY. C. W. Richardson, Washington, D. C. Annals of Otology, Rhinology and Laryngology, December, 1922.

POST-OPERATIVE COMPLICATIONS — CHILLING AND POST-OPERATIVE PNEUMONIA. Max Thorek, Chicago. Medical Sentinel, May, 1923.

POST-OPERATIVE COMPLICATIONS — POST-TONSILLECTOMY PULMONARY ABSCESS. Mary E. Botsford, San Francisco. California State Journal of Medicine, January, 1923.

PRE-OPERATIVE COMPLICATIONS—THE DETERMINATION OF CARDIAC EFFICIENCY. D. W. Carter, Jr., Dallas. Texas State Journal of Medicine, February, 1923.

PRE-OPERATIVE COMPLICATIONS—DIASTASE IN THE BLOOD AND URINE AS A MEASURE OF RENAL EFFICIENCY. G. A. Harrison and R. D. Lawrence. Journal of Tropical Medicine and Hygiene, January 28, 1923.

PRE-OPERATIVE COMPLICATIONS—EXAMINATION OF BLOOD IN SURGICAL AFFECTIONS. O. Stahl. Archiv für klinische Chirurgie, December 14, 1922.

PRE-OPERATIVE COMPLICATIONS—TREATMENT OF CARDIAC FAILURE DURING PREGNANCY. H. E. B. Pardee, New York. Bulletin Lying-in Hospital of the City of New York, January, 1923.

PRE-OPERATIVE COMPLICATIONS—MYOCARDIAL DEFICIENCY FROM A SURGICAL STANDPOINT. J. L. Yates, M. F. Rogers and R. E. Morter, Milwaukee. Wisconsin Medical Journal, April, 1923.

PREPARATORY TREATMENT OF PATIENTS FOR OPERATIONS UPON THE GASTRO-INTESTINAL TRACT. O. H. Hart, St. Johns. Journal Michigan State Medical Society, May, 1923.

PRE-OPERATIVE COMPLICATIONS—INFLUENZA AS A FACTOR IN OPERATIVE COMPLICATIONS. H. Czermak. Archiv für klinische Chirurgie, February 10, 1923.

PRE-OPERATIVE EXAMINATION. F. F. Gundrum and J. B. Harris, Sacramento California State Journal of Medicine, March, 1923

PRE-OPERATIVE COMPLICATIONS — DIABETES COMPLICATING SURGERY. A. T. Jones, Providence, R. I. Boston Medical and Surgical Journal, April 5, 1923.

PRE-OPERATIVE COMPLICATIONS—IMMEDIATE VS. DELAYED OPERATION IN CASES OF COLLAPSE FOLLOWING RUPTURED ECTOPIC PREGNANCY. E. M. Hawks, New York. Surgery, Gynecology and Obstetrics, February, 1922.

PRE-OPERATIVE COMPLICATIONS—DETERMINATION OF KIDNEY EFFICIENCY. K. M. Lynch, Dallas. Texas State Journal of Medicine, February, 1923.

RESPIRATION, EFFECTS OF CHLOROFORM ON, OF DEAD AND LIVING TISSUES. G. B. Ray, Cambridge, Mass. Journal of General Physiology, March, 1923.

RESPIRATION, ACTION OF DRUGS ON MORPHIN, ETHER, CHLOROFORM, CHLORAL, URETHANE, LUMINAL, MAGNESIUM, CAFFEIN, STRYCHNIN AND ATROPIN. C. F. Schmidt and W. B. Harer, Philadelphia, Pa. Journal of Experimental Medicine, January, 1923

RESUSCITATION, HEART MASSAGE AS A FINAL RESORT FOR HEART FAILURE UNDER GENERAL ANESTHESIA. T. C. Bost, Charlotte, N. C. Surgery, Gynecology and Obstetrics, February, 1923.

SCOPOLAMIN-MORPHIN ANESTHESIA IN OBSTETRICS, A SAFE AND PRACTICAL METHOD OF ADMINISTERING. Bertha Van Hoosen, Chicago. New Orleans Medical and Surgical Journal, March, 1923.

SOMNOFORM AS A SYNERGIST TO GAS-OXYGEN ANESTHESIA; A PRELIMINARY REPORT ON; AND THE "LAFAYETTE PLAN" DRAPING FOR THYROID SURGERY; A NEW GOITER MASK AND MODIFIED FOUR-VALVE GAS-OXYGEN APPARATUS. Floyd T. Romberger, Lafayette, Ind. Current Reasearches in Anesthesia and Analgesia, February, 1923.

American Journal of Surgery

QUARTERLY SUPPLEMENT of ANESTHESIA & ANALGESIA

(American Journal of Anesthesia and Analgesia)

Printing Papers from the Transactions of the

Interstate Association of Anesthetists
American Association of Anesthetists
Canadian Society of Anesthetists
Scottish Society of Anesthetists
Mid-Western Association of Anesthetists
Pacific Coast Association of Anesthetists
National Anesthesia Research Society
New York Society of Anesthetists
Royal Society of Medicine, Anesthetic Section
Boston, Providence, Toledo, Louisville, Indianapolis, Chicago, Kansas City, Colorado, Seattle, Northern and Southern California Societies of Anesthetists

F. H. McMECHAN, M.A., M.D., Editor

Associate Editors

JAMES TAYLOE GWATHMEY, M.D.
DUDLEY W. BUXTON, M.D., M.R.C.P.
WILLIS D. GATCH, M.D., F.A.C.S.
JOHN D. MORTIMER, M.D., F.R.C.S.
ARTHUR E. GUEDEL, M. D.
ARTHUR E. HERTZLER, M.D., F.A.C.S.
WM. HARPER DEFORD, D.D.S., M.D.
ISABELLA C. HERB, A.B., M.D.
G. A. H. BARTON, A.B., M.D.
SAMUEL JOHNSTON, M.A., M.D.
FRANCIS E. SHIPWAY, M.A., M.D.
CHARLES K. TETER, D.D.S.
CARROLL W. ALLEN, M.D., F.A.C.S.
EDWARD H. EMBLEY, M.D., B.Ch.
TORRANCE THOMPSON, M.D.
PROF. YANDELL HENDERSON, Ph.D.
E. I. McKESSON, A.B., M.D.
ARTHUR E. SMITH, M.D., D.D.S.
J. F. W. SILK, M.D., O.B.E.
H. E. G. BOYLE, O.B.E., M.R.C.S.

October — *CONTENTS OF THIS ISSUE* — *1923*

POSITIVE PRESSURE FOR THORACIC SURGERY WITH NITROUS OXID-OXYGEN ANESTHESIA	Sterling Bunnell, San Francisco, Calif.	98
NITROUS OXID-OXYGEN IN OBSTETRICS	Thomas A. Card, Riverside, Calif.	105
SPINAL ANALGESIA IN OBSTETRICS, INCLUDING CESAREAN SECTION: OR PAINLESS CONSCIOUS CHILDBIRTH	Harry T. Cooke, Los Angeles, Calif.	107
MEDICO-LEGAL AND OBSTETRICAL OBSERVATIONS ON SCOPOLAMIN ANESTHESIA	E. House, Ferris, Texas.	111
SELECTIVE ANESTHESIA FOR MOUTH AND JAW SURGERY	Frank Chandler, Los Angeles, Calif.	116
THE PRE- AND POSTOPERATIVE CARE OF SURGICAL PATIENTS: WITH ESPECIAL REFERENCE TO THE HAZARDOUS RISKS	R. F. Hastreiter, Los Angeles, Calif.	119

DEPARTMENTS

EDITORIALS	122	SOCIETY PROCEEDINGS	125
BOOK REVIEWS	123	QUARTERLY INDEX	127

POSITIVE PRESSURE FOR THORACIC SURGERY WITH NITROUS OXID-OXYGEN ANESTHESIA.*

STERLING BUNNELL, M.D.,
SAN FRANCISCO, CALIF.

Fourteen years ago, when nitrous oxid and oxygen anesthesia was coming into frequent use in a few clinics in this country, I conceived the idea of using the pressure of those gases to supply positive pressure for thoracic surgery, and, in 1909, by experimental surgery on dogs devised a method for its use, which was published in January, 1910.

The principle of using differential pressure in operative pneumothorax was introduced by Tuffier and Hallion (November, 1896), and by Quenu and Longuet (December, 1896), twenty-seven years ago. The elaborate cabinet method followed, in 1904, and the intratracheal method, in 1910. The latter has been the method most used in the last decade. It is gratifying to now see that the anesthetists have turned their attention towards nitrous oxid and oxygen as the anesthetic of choice in lung cases.

ADVANTAGES OF THE METHOD.

In the method to be described the differential pressure apparatus is the size of a jack-knife and is snapped to the mask of any standard nitrous oxid and oxygen apparatus. There is no more difficulty in applying the pressure than in giving the ordinary gas and oxygen anesthesia. There is no other method of obtaining differential pressure for thoracic surgery that combines such safety to the patient, simplicity of apparatus and ease of administration.

Safety.—Safety to the patient is gained in various ways. Postoperative pneumonia is an ever present danger after operations involving thoracotomy, especially in cases where there is lung pathology. Ether anesthesia, with its irritating effect on the lungs, greatly increases this danger. By using nitrous oxid and oxygen, which is non-irritating to the lungs, we avoid this danger and we are using the safest of all general anesthetics. As compared with ether, there is little or no shock in gas and oxygen and shock and lowering of resistance are important factors in causing death following operations within the chest. Also it being non-inflammable a cautery may be used on the lungs without danger of explosion. The intratracheal catheter causes, in a percentage of cases, postoperative infection, ranging from bronchitis to pneumonia. With the method to be described, no foreign body is introduced into the trachea.

Simplicity.—In the past administration of positive pressure through a face mask has failed, because ether has been used as the anesthetic. Ether causes the collection of mucus in the throat, coughing, vomiting and such relaxation that the tongue falls back into the pharnyx, thus necessitating the frequent removal of the mask and consequent intermittent collapse of the lungs. These emergencies, which are practically not encountered when nitrous oxid and oxygen are used, make the face mask impracticable with ether and necessitate a catheterization of the trachea or the enclosure of the head or the body of the patient in a cabinet. Nitrous oxid and oxygen is the only general anesthetic that will allow the continuous application of a mask to the face throughout an operation. This greatly simplifies our problem, as our anesthetic is administered by our usual apparatus and in the regular way. Catheterization of the trachea, which is technically difficult to do, is avoided. Moreover, this is the only method in which no form of pump is used. The expansion of the gases as they escape from the cylinders furnishes all the pressure necessary.

THE APPARATUS AND PRINCIPLES.

The only special apparatus needed is a small spring device. This is made to fit onto the valve stem of the mask of any standard nitrous oxid and oxygen apparatus. As can be seen in the picture the slider is set at any desired point and presses the spring that pushes the lever which presses the valve of the mask. Thus the position of the slider controls directly the degree of inflation of the lungs.

The expansion of the nitrous oxid and oxygen as they are allowed to escape from their storage cylinders furnishes the positive pressure. The mixed gases are delivered into a mask and can escape only when they are under sufficient pressure to force open an exit valve, which is closed by a spring set at the desired pressure. As the patient inhales the valve closes and he inhales nitrous oxid and oxygen. As he exhales this exit valve opens and the expired gases escape. This takes place with ordinary anesthesia with any standard gas and oxygen apparatus without differential pressure. The pressure on the valve,

*Read during the Joint Meeting of the American, Pacific Coast and California State Anesthetists, at the Hotel Stewart, San Francisco, June 22-26, 1923.

which is the only open part of this respiratory system from the tank to the lungs, is then atmospheric pressure. When the spring device is applied the physiologic conditions are not altered, but a little additional pressure is added to atmospheric pressure on the exit valve. It is the same as if the head of the patient were in a cabinet with

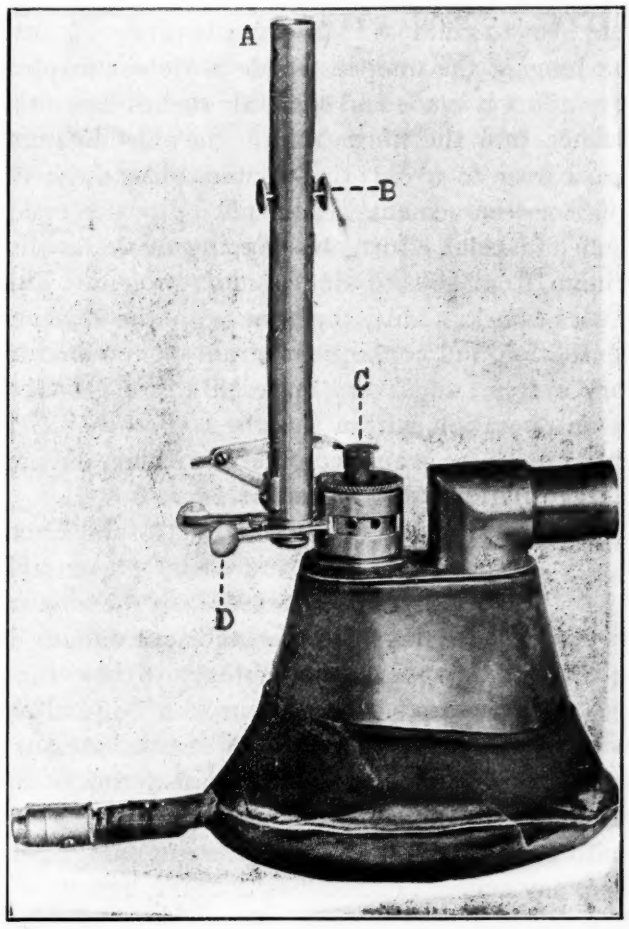


Fig. 1.—Showing mask for nitrous oxid and oxygen anesthesia and snapped to the stem of its exit valve a spring device—A, which raises the pressure so as to prevent collapse of the lungs in operations within the thorax. The spring device is the only special apparatus needed for positive pressure. B—Slider, which presses a spring down upon the lever. C—Lever pressing on valve of mask by means of short piece of rubber tubing interposed. D—Clamp, by which the spring device is snapped onto the valve-stem of the mask.

pressure a little more than atmospheric (say 768 mm. Hg. instead of 760).

The pressure in the mask can never exceed this amount, because the valve will open and it will never fall below this amount because of the flow of gases into the mask. It will be seen that the lungs will remain inflated to any desired degree and if an extra large gush of gas should rush from the tank the impulse is not visably transmitted to the lungs, but merely spends itself through the exit valve.

The method worked well with the early gas and oxygen apparatus, which delivered an uneven flow of gas. The modern apparatus is equipped with pressure reducing valves and delivers an even flow.

Directions for Use.

The patient should first have morphin gr. 1/4 and atrophin gr. 1/150; less nitrous oxid will then be required. One person should give the anesthetic and another should manage the mask and pressure device. When the chest is about to be opened the spring device should be snapped onto the valve of the mask and the slider moved down to the mark corresponding to Hg. This extra pressure is not noticeable in the breathing and now when the chest is open the lungs do not collapse. The mask should be kept snugly on the face with the pneumatic rim well inflated. If it does not quite fit a towel permeated with perolatum should be looped around it. This will make it air tight. In adjusting the position of the slider one should be governed entirely by the degree of inflation of the lungs. They should be kept almost flush with the chest wall. Great care should be taken to move the slider slowly. It will be found that at all times one can cause a great inspiration by suddenly moving up the slider, thus removing the pressure. A sudden collapse of the lung is the greatest stimulus to an inspiration and is a terrific shock to the patient, as such collapse never occurs during life. Sudden releasing of slider should be carefully avoided and used only to cure apnea.

The lungs should never be allowed to bulge into the wound, but should be brought up to it as the chest is closed.

Before the operation the nitrous oxid and oxygen apparatus should be gone over while it is under water and all leaks should be repaired with adhesive plaster. Much gas can be saved by so doing. It is important to ascertain before starting that the cylinders of nitrous oxid and oxygen are full.

The first impression is that the irregularity of the flow of gases subjects the lungs to a sudden burst of pressure. This is not the fact. The exit valve is a safety valve, and being large it never allows the pressure to exceed the amount for which the slider is set. Clinically the degree of inflation of the lungs is not visably altered by the irregularity in the flow of gases, but remains constantly under perfect control by the position of the slider. The elastic force of the lungs themselves is exactly counterbalanced by the slight increase of pressure within them and the size of the lungs, even with both pleural cavities

open, is then easily influenced by the expansion and contraction of the chest walls, which closely surround them. In inspiration it is as easy for the gases to pass down the trachea and push the lung periphery ahead of it to follow the receding chest wall, as it is for air to enter the chest through the wound, so it will be seen that the inflated lungs expand and contract during the time the thorax is open to the same extent that they do in ordinary quiet breathing. The chest wall excursions are slightly greater than in quiet breathing, though with much reserve ability and not in the least labored. The valve opens and closes rhythmically with respiration and the quiet hissing of the gases escaping through it can be heard at each expiration. With a greater flow of gases a slight hissing is heard in inspiration also.

The spring device may be used for artificial respiration, as by moving the slider up and down the lungs can be rhythmically filled with oxygen and allowed to collapse.

In case the chest is not open the slider may be moved down without danger of over-distention, but, with the chest open, it should be moved not more than to the one-half inch mark, which corresponds to a pressure of 8 mm. Hg.

A caution worth mentioning in chest surgery is to avoid having the patient lie on his sound side, as it interferes with respiratory movements of the side of the chest most needed. If the anesthetized patient, with a distended pyothorax, lies on his sound side he will quickly die. A position in which one side of the chest is raised 50 degrees will give ample surgical access and free respiratory movements.

NECESSITY FOR DIFFERENTIAL PRESSURE.

It is possible in some cases to perform an intrathoracic operation without differential pressure. I am convinced that it is not justifiable to do so unless from necessity. In the great war many chests were opened and closed without the use of differential pressure. I, too, did this repeatedly in the evacuation hospitals in France and the patients lived. It is from these experiences that since the war many surgeons have unfortunately spread the doctrine that when but one pleural cavity is open differential pressure is unnecessary. Let us consider what takes place:—

The great labored respirations that occur when the chest is open cause the mediastinum to flap violently from side to side. When the lungs collapse, as they do when the chest is open, there is insufficient ventilation of the blood and in a frantic effort to compensate for this, respiratory movements become most violent. It is now known that in a cadaver when one pleural cavity is open the pressure in both pleural cavities is practically equal (differing by but .8 mm. Hg.). This is because the mediastinum, which has no lateral stability, is free to be displaced into the unopened pleural cavity, allowing the lung of that side also to collapse. In order to draw air into the lung of the unopened side a violent inspiratory effort is made and some air rushes down the trachea into the lung before the mediastinum snaps over to avoid the vacuum. As these inspiratory movements are made with the maximum muscular effort, the flapping of the mediastinum from side to side is most violent. This causes shock. This, together with the lessened ventilation and consequent strain on the circulatory system, adds very materially to the hazard of an operation within the chest. When differential pressure is applied quiet breathing and ample ventilation are restored at once.

The added shock ("traumatopnia") and circulatory strain are entirely and easily preventable by the use of differential pressure. In the absence of pleural adhesions there is sufficient danger in operations involving thoracotomy. How then, except in emergency, can a surgeon be justified, who by neglecting to utilize differential pressure, subject his patient to this additional shock and circulatory strain? Tamponing with gauze and pulling on the lung are not sufficient safeguards. We may succeed in avoiding a death, but we will have shocked our patient. Of 41 cases of thoracotomy without differential pressure, Parham states that 60% showed symptoms of distress and 36% showed alarming or critical symptoms. Gerulanos states that of his series 31% showed alarming symptoms. A direct ratio exists between the vital capacity of a given case and the maximum size of the opening that can be made in the chest without actually causing prompt death. With even a large vital capacity a small opening below the lethal ratio will impose a strain on the patient.

Matas, in 1921, in an extensive review of the subject, conclusively proves the necessity of differential pressure.

Many deaths have been reported from opening chests without differential pressure. I have personally witnessed several. We have all seen cases where, due to collapse, a forced rapid closure of the chest has been necessary. On the bat-

tlefield it was found that if the sucking wounds of the chest were closed with a stitch (the life saving stitch as it was called) that these patients could be safely transported to the hospials, whereas oherwise they would have died. They were saved the added shock and strain of the open chest.

TYPES OF CASES AND RESULTS.

In the following 20 cases of thoracotomy positive pressure was used with nitrous oxid and oxygen anesthesia. The operations were done for the following conditions:—

Conditions.	Cases.
Abscess of the lung	3
Bronchiectasis	2
Bullet wound	1
Chronic pyothorax	1
Infection of the lung	1
Ingrowing deformity of chest	1
Mediastinal tumor	1
Pyothorax (acute)	4
Removal of thoracic esophagus	2
Sub-acute pleurisy	1
Tumor of chest-wall	2
Tumor of lung	1

In five of the cases adhesions were present. In five some adhesions were present, but were freed. Ten of the cases were free from adhesions. Therefore, in fifteen of the 20 cases the lungs were or were made free from adhesions.

The degree of inflation of the lungs was always under perfect control. The lungs moved to and fro about an inch following the excursions of the chest-wall. The ventilation of the patient remained good throughout and there was an absence of the extreme labored efforts at respiration seen when no pressure is used.

The method has proven to be thoroughly satisfactory and has fulfilled all the claims that have been made for it.

In the cases of pyothorax the use of positive pressure was of distinct advantage. Usually in these cases when the chest is open the respiratory movements are labored and gasping and the pus is shot out explosively. When the positive pressure was used there was no change in respiration on opening the chest and the pus flowed out quietly.*

*It is interesting that James T. Gwathmey, after experimenting in France on dogs and wounded soldiers, concluded that nitrous oxid and oxygen under positive pressure was the method of choice in thoracotomy, as given in his publication of June 12, 1920. He obtains his positive pressure by merely holding the mask loosely on the face and relying for his pressure on the friction of the escaping gases.

ILLUSTRATIVE CASE REPORTS

Case No. 1.—Mr. V. April 7, 1910. Operator: W. I. Terry. Anesthetist: Edith H. Williams. This patient was so exhausted from prolonged and fetid bronchitis that when he came to the operating room he was moribund and cyanosed. This was not a complete test of the pressure method, as the lungs were held from total collapse by universal adhesions. The apparatus did, however, maintain as good or better ventilation than there was before the chest was opened and cyanosis was never marked and could always be driven away by turning on more oxygen. The ear remained pink. Parts of the three ribs were resected, allowing a wide opening of the left pleural cavity. During the fifty minutes this wound was open, the degree of inflation of the lung could be perfectly controlled and sufficient ventilation was maintained. Occasionally from manipulation of the lung the patient would stop breathing, but could always be made to breathe at once by rhythmically moving the slider. Sudden release of pressure was always followed by an inspiration even when in apnea. When the pressure was temporarily discontinued, just to see the result, the lower half of the lung made large excursions and the respiration became labored. (The patient lay on the sound side.) Before the opening of the chest, when ether was being used, the patient coughed constantly. The coughing ceased entirely when nitrous oxid was used and from then on there was no cause to remove the mask from the face. A large bronchiectatic cavity was opened and the chest was closed except for a drainage hole, which was covered by a rubber dam, and a dressing was applied. On removing the increase of pressure, the respiration became labored, as the deossified chest-wall made great excursions, and soon cyanosis appeared and the pulse quickened. The resumption of positive pressure immediately relieved the condition until a larger and firmer dressing could be applied.

The patient died in seven hours, but owing to his former condition and the gravity of the operation, this was not surprising. Also no caution was used in allowing sudden lung collapse by suddenly releasing the slider and this causes reflex shock.

Case No. 2.—Mrs. M., Dec. 15, 1911. Operator: Thomas W. Huntington, at the University of California Hospital. Anesthetist: Mary Botsford. After performing an amputation of the breast, a cancerous piece of chest-wall, 3 by 4 inches, was removed, including part of the third, fourth and fifth ribs. This wound remained open for thirty-five minutes, during which time there was not the slightest unfavorable sign. The lungs remained pink and constantly inflated to just the right amount. The lung moved to and fro for about half an inch to one inch following the respiratory movements of the chest wall and was sufficiently still to have any operation of reasonable delicacy performed on it.

The degree of inflation of the lung could be controlled to a nicety by simply adjusting the slider and the lung was kept almost flush with the parietal pleura. When a sudden burst of gas would come with a rush from the cylinder, it spent itself entirely through the valve and the impulse transmitted to the

lung was not noticeable. Though the pressure varied in the tubes of the Teter machine, the pressure in the lungs remained constant, as it could never rise above the pressure on the valve. Respiration was not in the least labored nor hardly perceptibly changed, and its rate kept between 25 and 30. The wound was closed with skin and the patient was sent to bed in good condition after an operation lasting two hours and twenty-five minutes. The lung was free from adhesions, making this rigid test for efficiency of the apparatus. It must be said, and without a qualification, that the apparatus worked perfectly. The patient awoke at once, had no shock, and with the exception of a slight hematothorax, which eventually disappeared, made an uninterrupted recovery.

Case No. 3.—Mr. K., June 15, 1911. Operator: W. I. Terry. Anesthetist: Mary Botsford. This patient had a large, three year old, encapsulated sarcoma of the chest-wall, which was crowding the right lung, and a resection of it was attempted as a palliative operation. A piece of the anterior chest-wall, 7 inches in diameter, including the clavicle and first four ribs, was severed from all but its connections posteriorly and along the great vessels, during which time the chest cavity was open. As the lung and tumor adhered, it was necessary to cut across the upper lobe and sew it over. The man was large and a professional athlete and difficult to keep anesthetized with nitrous oxid until considerable morphin was given. Narcosis was then easily maintained. At one time, through an unavoidable error, the flow of oxygen was interrupted and the patient became cyanosed and ceased to breathe. As soon as the oxygen tank was again connected, the spring device was used, as described, for artificial respiration and breathing was resumed. The chest cavity was kept open for one hour and twenty-two minutes, during which time the degree of inflation of the lung was always under control and, barring the exception mentioned, respiration was maintained without any embarrassment of breathing. The lungs did not collapse and never were in the least overdistended. They were kept almost flush with the chest-wall and receded from the opening about an inch with each inspiration. The condition of the patient remained good through two hours of operating and then, owing to the great amount of hemorrhage, the pulse became rapid and the incision was rapidly closed, intending to complete the excision in a second operation.

The patient was in an exsanguinated condition and lived but twelve hours. Throughout the one hour and twenty-two minutes, in which the chest was open, the pressure apparatus accomplished its share of the operation in a perfectly satisfactory manner and was not in any way the cause of death.*

Case No. 4.—Man, aged 45 years, Dec. 21, 1912. Operator: J. Henry Barbat. Anesthetist: Edith H. Williams. Operation for cancer of the esophagus 25 centimeters from the teeth. One incision was made through the third intercostal space and the second incision was made through the fifth intercostal space. With ribspreaders these spaces were spread widely. The thoracic esophagus was freed and its cancerous part was removed. The upper end of the esophagus was brought out through an opening in the neck. The operation consumed three hours, during two hours and fifteen minutes of which the chest cavity was open. For a considerable part of this time both pleural cavities were open simultaneously. The condition of the patient throughout the operation was good and there was no respiratory embarrassment. The lungs filled and partially emptied rhythmically and the opening of the thorax did not have any appreciable effect on the condition of the patient. The lung was free from adhesions. At the completion of the operation the condition of the patient was excellent. His pulse was 120 and respirations were 28. After a few hours a hissing of air was heard through the neck wound and from then on the patient's condition became worse. His pulse rose to 140 and respirations to 30. At the end of 52 hours he became cyanosed and died.

Case No. 5.—W. E. B., aged 40 years, Sept. 5, 1914. Operator: Sterling Bunnell. Anesthetist: J. F. Peattie. Condition: Acute pyothorax. The patient was at first laid on his sound side. He soon became cyanosed and pulseless and ceased to breathe. He was then placed on his back and after half a minute of artificial respiration he recovered. From then on he was kept on his back slightly inclined to the sound side. Positive pressure was applied and the chest was opened. Instead of the gasping respiration usually seen on opening a pyothorax there was no change in the respiration and no circulatory embarrassment. The large quantity of pus merely flowed out in an even stream. Adhesions were broken up and the lungs expanded to the chest-wall in about 15 breaths. The patient was returned to bed in unusually good condition.

Case No. 6.—Chinese. Sept. 8, 1914. Operator: T. Russell. Condition: Acute pyothorax. On opening the pleural cavity the pus flowed out evenly. There was no shock and no change in respiration. The lung was at first an inch from the chest wound, but soon expanded until it was flush with the chest-wall. The pressure was then removed in order to see the effect. Respirations became somewhat deeper, but no serious trouble resulted. The operator remarked that the positive pressure made the operation very much easier on the patient than it would have been without it.

Case No. 7.—Woman. April 26, 1912. Operator: W. I. Terry. Anesthetist: C. Kane. Condition: Recurrent carcinomatous nodules in the chest-wall. Portions of two ribs were resected in the anterior part of the right chest. Adhesions prevented the lung from fully collapsing, so that it receded until it was about three inches from the chest-wall. No positive pressure was used or needed until the closure. Positive pressure was then applied and the lung easily, and with perfect control, inflated to the chest-wall as the wound was closed. She made a good recovery.

Case No. 8.—J. W., aged 53 years. May 23, 1912. Operator: Sterling Bunnell. Anesthetist: Edith H.

*Cases 1, 2 and 3 were previously reported in *The Journal of the A. M. A.*, March 23, 1912.

Williams. Condition: Acute right-sided pyothorax. The left side of the chest was already open for drainage of a left-sided pyothorax. Positive pressure was applied and a portion of the seventh rib on the right side was resected. A quart and a half of pus flowed out of the wound. Both pleural cavities were open in this case. There was not the least sign of respiratory embarrassment and the respiratory movements were quiet and regular. A rubber dam valve was strapped over the right-sided wound and the patient was returned to bed in very good condition. Respirations were 22 and the pulse had dropped from 120, which it was previous to operation, to 108.

Case No. 9.—Girl. January 21, 1915. Operator: Chas. G. Levison. Anesthetist: Edith H. Williams. Condition: Bronchiectasis. Under local anesthesia a portion of the eighth rib was resected. As the pleural cavity was opened the patient began to cough and the respirations became labored. Positive pressure was then applied, with nitrous oxid and oxygen, and the patient at once resumed normal breathing. It was seen that the lung was free from adhesions. By the positive pressure the degree of inflation of the lung could be easily controlled. The lung was inflated to the chest-wall, where it was attached by suturing to the parietal pleura. The patient made an uninterrupted operative recovery.

Case No. 10.—J. K., aged 35 years. April 14, 1915. Operator: H. Brunn. Condition: Chronic pyothorax of one year's standing, resulting from pneumonia. Three inches of each of four ribs were resected. At first it was found that positive pressure was not necessary, because the lung was held by adhesions. The excursions of the lung were not great. All adhesions were then broken through. From this time on positive pressure was of considerable benefit to the patient in preventing the lung excursion from being too great. The lung could be easily and accurately distended at will and under the pressure it made excursions of an amplitude of one inch. Without the pressure, the excursions were of two and a half inches and with considerable labored respiration. A pint of pus was removed. The chest was open for an hour and five minutes and the operation lasted two hours. The condition of the patient at the completion of the operation was good.

Case No. 11.—Miss E. C., aged 27 years. March 31, 1917. Operator: P. Campiche. Anesthetist: Edith H. Williams. Condition: Abscess of lower lobe of the right lung of two months standing following pneumonia. Seven centimeters of the sixth to the tenth ribs each were resected. Positive pressure was applied and the pleura was opened. The lungs were inflated and remained so. There were a few light adhesions to the middle lobe and these were broken through. The lower lobe was somewhat adherent. There was no pleural embarrassment during the operation and the inflation of the lungs was always under control. The middle lobe was stitched to the chest-wall and the abscess cavity was opened and drained. The patient stood the operation well.

Case No. 12.—F. C., aged 20 years. Operator: Sterling Bunnell. Anesthetist: Z. Pettis. Condition: Pyothorax of six weeks standing following pneumonia. Two and a half inches of the tenth rib was resected and a large cavity running up to the apex of the lung was opened. The pus from this cavity rolled out evenly. There was an absence of the heaving breathing usually seen when no positive pressure is used.

Case No. 13.—Mr. H. V., aged 30 years. April 28, 1920. Operator: Sterling Bunnell. Condition: For 17 days he had acute pain in the left arm. His temperature was 103° and pulse 110. There was dullness, with diminished breath sounds over the base of the left lung. When aspirated turbid yellow fluid was obtained rich in albumin and containing both lymphocytes and leucocytes in equal numbers. White count 15,000, with 77% polys.

A portion of the tenth rib was resected; positive pressure was applied and the left pleural cavity was widely opened. The lung was free from adhesions. The parietal pleura was two mm thick, yellowish and translucent. A piece of it was obtained for diagnosis. The visceral pleura was but little affected. While the chest was open the lungs were kept well inflated and moved freely inside the chest cavity following the excursions of the chest-wall and their amplitude was about one inch and a half. As the chest was closed, the lung was inflated until it completely filled the pleural cavity. The patient made a prompt and complete recovery. The report of the pathologist was sub-acute pleurisy.

Case No. 14.*—Mrs. L. A., aged 32 years. Aug. 25, 1920. Operator: Sterling Bunnell. Anesthetist Edith H. Williams. Condition: Carcinoma of the esophagus behind the arch of the aorta. There had been pain and difficulty in swallowing for four months, and 22 days previously a gastrectomy had been performed. Operation: A long intercostal incision in the sixth space was made and spread widely. There were a few adhesions to the lung posteriorly and at the apex, but these were freed. The thoracic esophagus, with the cancer, was excised. The lower end of the esophagus was invaginated. The upper end was brought out through an opening in the neck. The pleura was closed with the exception of a drainage hole, over which was placed some rubber dam as a valve. Positive pressure was applied before the chest was opened and on opening it there was an absence of shock or any appreciable change in the respirations. The lungs were kept inflated to the desired degree and expanded and contracted with the movements of the chest-wall. There was no embarrassment whatever of respirations, though the chest was kept widely open for an hour and a half. The operation lasted two hours and fifteen minutes. The circulatory and respiratory condition of the patient remained good throughout. At the conclusion of the operation a transfusion was done; the color was good; the pulse was 124 and fairly strong and the respiration was 17. For five days she remained in fairly good condition until mediastinitus and pyothorax developed as the result of spilling the car-

*(Reported in *Surg., Gyn. & Obsts.*, March, 1922.)

cinomatous tissue while it was being removed, and on the sixth day the patient died of sepsis.

This case furnished an excellent test for the positive pressure, in that a very wide opening was maintained for an hour and a half and the lung was made free from adhesions.

Case No. 15.—E. L. M., aged 29 years. Sept. 14, 1920. Operator: Sterling Bunnell. Anesthetist: J. Anderson. Condition: The patient suffered severely and especially in the last five years from pain, dyspnea and bronchitis, due to an ingrowing chest, so that the sternum touched the spine. Operation: All of the ribs on each side were severed in the nipple line. The sternum was slit longitudinally and the manubrium was cut across transversely. The sternum was hooked forward and made to hang by a wire from a previously made metal frame over the front of the chest, so that the front of the chest, which was formerly concave was made convex. During the operation the pleura was open. Positive pressure was applied and normal respiration was maintained. The condition of the patient was not altered by opening his pleural cavity. The lungs were free from adhesions. At the end of the operation the pleura was closed; the condition of the patient was good throughout. Later he developed a right lower lobe pneumonia, probably due to the increased volume of the chest cavity, but he went through his crisis successfully on the ninth day.

Case No. 16.—A. C., aged 7 years. Operator: Harold Brunn. Condition: Some chronic infectious condition of the lung. Pulse, 130, temperature 99°. A right intercostal incision was made. Positive pressure was applied. The lung was partially atelectatic and free from adhesions. It expanded somewhat under the influence of positive pressure. The condition of the respiration was not changed on opening the chest and while the chest remained open the condition of the patient remained good. The exact diagnosis remained doubtful and the chest was closed. The patient left the operating room in practically the same condition as before the operation.

Case No. 17.—Male, aged 31 years. Operator: Asa Collins. Anesthetist: J. F. Peattie. Condition: Abscess in the lower right lobe of the side and soon became cyanotic. Resection of the lower rib on the right side was made. Pleural adhesions were broken up, so that the lung was free. Positive pressure was applied before the chest was opened and when the opening was made there was no change in the respirations. There was at times some tinge of cyanosis, due to the fact that the patient was on his sound side. The positive pressure worked well in spite of the position of the patient. When the pressure was removed temporarily he did poorly and showed heaving respiration. This immediately disappeared when the pressure was resumed. The incision was closed and the patient left the table in fairly good condition.

Case No. 18.—B. G. Indian, aged 20 years. Dec. 28, 1921. Operator: Sterling Bunnell. Anesthetist: Edith H. Williams. Condition: 30 hours previously he had been shot with a 32 caliber bullet, which entered to the left and below the left nipple, creased the heart and lodged in the lung just below the hilus. Pulse 84, respirations 40, temperature 99.2°. An intercostal incision was made in the sixth space and spread widely with ribspreaders to admit both hands. A quart of blood was removed from the pleural cavity. The lung was free from adhesions. Tuberculosis was palpated in the left apex. The anterior border of the left lung had been perforated by the bullet, but was not bleeding. Through a hole in the lung just below the hilus air and blood were escaping. Through it the bullet was extracted. The hole in the lung was then sutured. The lung was expanded flush to the chest-wall and the incision was closed. The chest was open 20 minutes. The operation lasted 33 minutes. At the completion the pulse was 105, respirations 32 and temperature 99.5°. As the chest was opened there was not a sufficient flow of gases, owing to the fact that a reducing valve in the nitrous oxid machine was not fully opened. The lungs collapsed and the respirations became greatly labored. The anesthetist soon turned the valves on. The lungs ballooned out at once and the condition of the patient was perfect from then on. The inflation of the lungs was under perfect control and they were made flush with the chest-wall as the wound was closed. The patient made an uneventful recovery. No fluid recollected in his chest and he returned to his home on the fourteenth day and has remained well ever since.

Case No. 19.—P. S., April, 1920. Operator: Leo Eleosser. Condition: Lung abscess and bronchiectatic cavity left. Portions of two ribs were resected. Lung was adherent, but the adhesions were entirely freed. The upper left lobe was indurated and there were bronchiectatic cavities in the lower left lobe. The visceral and parietal pleura were painted with iodine and iodoform gauze was sutured over the lung and the chest was closed. During the operation the lung could readily be expanded, under the positive pressure, to the chest-wall. The degree of inflation was always under control and the lung moved with excursions of about 2 inches. The patient was a poor risk and lay on his sound side. There was a slight tinge of cyanosis. The condition at the end of the operation was good. Pulse was 126 compared with 94 before the operation.

Case No. 20.—L. A. April 11, 1920. Operator: Leo Eleosser. Condition: Tumor of lung over left diaphragm. Under local anesthesia an incision was made in the sixth intercostal space. The patient was then anesthetized with nitrous oxid and oxygen and while he was still struggling the chest was opened and positive pressure was applied. The lung was inflated to the chest-wall. It was free from adhesions, except where the tumor was attached to the diaphragm. The tumor was not removed. While the chest was open the condition of the patient remained good. The lungs were kept evenly inflated and there was no respiratory embarrassment. The patient left the table in good condition.

516 SUTTER ST.

BIBLIOGRAPHY.

Bunnell, Sterling: The Use of Nitrous Oxid and Oxygen to Maintain Anesthesia and Positive Pressure for Thoracic

Surgery. *California State Jour. of Med.*, 1910, January.

Bunnell Sterling: The Use of Nitrous Oxid and Oxygen to Maintain Anesthesia and Positive Pressure for Thoracic Surgery. *Jour. of American Med. Ass'n.*, March 23, 1912, Vol. LVIII, pp. 835-838.

Barbat, J. Henry: Thoracic Esophagectomy; Report of a Case. *California State Jour. of Med.*, 1913, June.

Bunnell, Sterling: Esophagectomy. *Surg., Gyn. & Obsts.*, March, 1920, pp. 408-410.

Gwathmey, James T.: The Anesthesia Problem in Lung Surgery. *Medical Record*, June 12, 1920.

Williams, Edith H.: Nitrous Oxid-Oxygen under Positive Pressure in Thoracic Surgery. *Current Researches in Anesthesia and Analgesia*, February, 1923.

Matas, Rudolph: The Value of Artificial Aids to Respiration in Acute Operative Collapse of the Lungs (Surgical Pneumothorax) Occurring in the Course of Intrathoracic Operations. *Archives of Surgery*, July, 1922, Vol. 5, pp. 110-133.

NITROUS OXID-OXYGEN IN OBSTETRICS.

THOMAS A. CARD, A.B., M.D.,
RIVERSIDE, CALIF.

The value of anesthetics in labor is unfortunately not universally accepted by the profession. We still have those who believe that pain is a necessary accompaniment of childbirth. Others believe that the use of anesthetics is harmful to the fetus. The more modern scientific view, however, is that the judicious use of analgesia and anesthesia in labor is of value both to mother and babe, not only because pain is allayed, but also because opportunity is given the obstetrician to more adequately control the forces of labor and deliver the babe with the minimum of trauma to the maternal soft parts.

Whatever view one may hold on this subject it is undeniably true that there is an increasing demand on the part of women for painless parturition. If this demand is to be met the anesthetic, which will give the most perfect results with the maximum of safety to the mother and child, must be chosen. To meet this requirement it must relieve physical suffering and be applicable over a long period of time without any ill effect on uterine contractions or the maternal or fetal organism. Nor must it interfere with the intelligent cooperation of the mother. The anesthetics commonly used during labor are chloroform, ether, morphin and scopolamin and nitrous oxid-oxygen. This paper is concerned only with the consideration of the latter.

SOME HISTORICAL CONSIDERATIONS.

Nitrous oxid and oxygen were discovered by Joseph Priestly in 1774. Twenty-six years later Sir Humphrey Davy discovered the anesthetic properties of nitrous oxid and recommended its use in surgery in the following words: "Nitrous oxid seems capable of destroying physical pain and it may probably be used to advantage during surgical operations in which no great effusion of blood takes place." It was little used, however, until 1868 when Edmond Andrews, of Chicago, first combined oxygen with nitrous oxid and demonstrated that previous failures in its use were due to lack of oxygen.

A few years later Bert recommended its use in obstetrics. In 1880, Klikowitsch, of Petrograd, acting on this suggestion used nitrous oxid and oxygen in a series of some twenty-five cases. He used the gases in the proportion of 80 per cent nitrous oxid and 20 per cent oxygen, and observed that three or four inhalations rendered the uterine contraction practically painless, and that they were increased in frequency with no loss of strength. Later observers condemned the use of the gas, but they probably carried it to the anesthetic stage.

Thus, more than 100 years elapsed after its discovery before nitrous oxid and oxygen was extensively employed as an anesthetic. In this country nitrous oxid combined with oxygen was first used in operative obstetrics in cases where ether and chloroform were contraindicated.

In 1909, Webster reported a Cesarean section successfully done under this form of anesthesia. Later he used the gas in normal second stage labor. In 1910, Arthur Guedel advocated its use in second stage labor and, in 1913, Drs. Lynch and Hoag administered nitrous oxid and oxygen during labor to the stage of intermittent analgesia for more than six hours with satisfactory results. Since that time nitrous oxid and oxygen has come into more general use in obstetrics.

TECHNICAL POINTS IN ADMINISTRATION.

Nitrous oxid is a colorless gas with a sweetish taste. It is absorbed by the lungs, dissolved by the blood plasma and enters the cell in an aqueous solution. This fact accounts for the speed with which narcosis is produced and also for its rapid elimination from the system. Used alone nitrous oxid produces a marked cyanosis because it displaces oxygen from the red blood corpuscles. This difficulty is overcome when oxygen is combined with nitrous oxid in the proper proportions. Nitrous oxid produces narcosis while oxygen maintains life.

This gas requires a special apparatus for its administration. There are many types all of which have in common an adjustable mixing chamber by means of which the gases are conveyed to the patient in suitable proportions. The gas is inhaled through a tightly fitting face mask or nasal inhaler.

Nitrous oxid may be easily administered by means of these machines but certain principles must be observed if the greatest success is to be obtained. It

is of importance that the labor room be as quiet as possible. Hearing is the last sense to be lost and becomes much accentuated. For this reason patients are sometimes annoyed by sounds which would ordinarily pass unnoticed. The patient is prepared in the usual manner. Any comfortable position may be assumed during the late first stage and early second stage. Later the patient is placed in the desired position for delivery.

It has been noted by practically all observers that patients of a low degree of intelligence present more difficulties than intelligent patients. Foreign patients cooperate poorly because they do not understand what is required of them. Nervous and hysterical patients may cause trouble and always require more attention to the detail of administration than their more stolid sisters and it may be necessary with these to give continuous analgesia for a time. As with ether and chloroform we find that the larger and more masculine types require larger amounts of the gas. Dark skinned people must be watched more carefully because cyanosis is not detected so easily.

It is of the utmost importance that there be the closest cooperation between anesthetist and the patient. The patient should be instructed so that she may know exactly what is required of her. The technic must be varied to suit the individual case. Great care should be taken to have the patient under analgesia before the height of the contraction is reached otherwise the pain is accentuated with loss of expulsive effort. The hand placed on the abdomen is the best guide to the time of onset of contraction.

In normal labor only sufficient gas should be given to produce analgesia. This may be said to exist when the keen edge is taken from the pain but there is no loss of consciousness. In my private practice I use the following technic: In general the administration of gas is begun at the onset of second stage labor. Those patients with irritable uteri who have frequent severe pains are given gas late in first stage. The routine procedure is to begin the administration with practically 100 per cent nitrous oxid, reducing on the second inhalation to 95 per cent nitrous oxid and 5 per cent oxygen inhalation and with the third inhalation to 90 per cent nitrous oxid and 10 per cent oxygen, the third inhalation is held and the patient bears down, aiding herself by means of side straps. After a suitable continuous effort the breath is exhaled and another deep breath of 90 per cent nitrous oxid and 10 per cent oxygen is taken and bearing down resumed until the conclusion of the contraction. In prolonged pains it is sometimes necessary to give a fifth breath. By this means nitrous oxid of sufficient concentration is kept in the lungs until the maximum uterine contraction is passed. During the interval between pains the patient breathes deeply of air and rests. A few deep breaths of air serve to clear the mind and overcome any dizziness.

In the great majority of cases this technic suffices to produce a satisfactory analgesia. It occasionally happens that very large patients require more than three breaths to produce analgesia. Again there are some with very severe labor pains who require a higher concentration of nitrous oxid and more breaths. On the other hand those patients with weak and less painful second stage pains need fewer breaths and a lower percentage of nitrous oxid. With these patients great care must be exercised not to produce anesthesia. Satisfactory results are not always obtained with the foreign patients because of their ignorance of the English language. Highly nervous women also give unsatisfactory results because they cooperate very poorly and in a few of these cases it has been necessary to resort to ether or chloroform.

These cases show that the administration of nitrous oxid cannot be reduced to a purely mechanical routine. If we are to get the best results each patient must be studied by the anesthetist.

Rebreathing was practiced to a limited extent but it was found that best results were obtained without its use and I have of late discarded it.

RELATION TO OBSTETRICAL PROCEDURES.

At all times there must be close cooperation between the anesthetist and obstetrician. When the presenting part begins to stretch the perineum a higher concentration of gas or more inhalations are given. When the presenting part is about to be delivered or when episiotomy is to be performed the anesthetist permits the patient to breathe steadily until under anesthesia. The head is then delivered under control and painlessly. As soon as the head is born 100 per cent oxygen is administered to the mother. A few breaths suffice to give a pink color to the babe provided there is good pulsation in the cord. This procedure is especially helpful in cases of asphyxia.

The placenta is delivered after the patient has inhaled three of four breaths of 90 per cent nitrous oxid. Immediate perineal repairs are done with the patient under analgesia or light anesthesia, unless considerable time is required for the work, when ether is used because of the expense.

Practically all forceps operations are performed under nitrous oxid analgesia. Versions have been done in some instances but where the uterus is very

irritable or where there has been early rupture of the membranes ether is used.

In Cesarean sections gas anesthesia is given until delivery of the babe, when ether is used except in cases where its use is contraindicated.

Of late I permit the patient to have gas earlier in first stage if the labor is very painful. During this stage 80 per cent nitrous oxid and 20 per cent oxygen is given and only three breaths are permitted. This makes a tedious stage more endurable without any ill effect to the mother or babe.

In both private and clinic practice I have found that the described technic gives excellent results and has many advantages over other anesthetics. To my mind its use is indicated in all normal labors and in operative obstetrics with the exceptions already mentioned.

Further Considerations.

Properly given nitrous oxid is absolutely safe. Death from its use is unthinkable. It is the least harmful of all known anesthetics in its immediate effects on metabolism. It is neither a cardiac depressor nor a liver poison, and it is rapidly eliminated from the system.

According to McKesson the claim that it raises blood pressure is erroneous. He states—"These gases may be administered for two hours without a material change in diastolic or systolic pressure. There is a time limit beyond which the blood pressure will progressively fall even under nitrous oxid, but unlike ether, in the case of the gases this fall is stopped immediately upon removing the anesthetic and it is followed by a comparatively rapid rise approaching normal pressure in a few minutes."

There are practically no contraindications for its use. It is well borne by tubercular patients and by those with heart and kidney lesions. It does not prolong second stage labor as does scopolamin and morphin but rather shortens it. It does not decrease but rather stimulates uterine contractions, and because of its analgesic action makes the mother capable of doing more effective work. It does not favor post-partum hemorrhage. It does not contraindicate the use of any other drug. The desired degree of analgesia and anesthesia may be given intermittently over a long period of time without any harmful effect on mother or fetus.

The continuous use causes slight degenerative changes but these are less marked than with chloroform and consists mainly in cell asphyxiation.—(Davis)

Experience in the war showed that nitrous oxid and oxygen is less likely to produce acidosis and shock than ether and therefore the drug is indicated especially in exsanguinated women or those showing symptoms of shock.

Relaxation and more perfect control of forces of labor lessens the number of lacerations. It is claimed by Davis that better milk supply is insured as indicated by the fact that the immediate loss of weight in the newborn is less than the average.

Patients prefer this anesthetic because the odor is not disagreeable. There is no nausea. They have relief from pain without loss of consciousness. Its action is quick and recovery following is prompt. They come through labor less exhausted and with less dread of future pregnancies.

The only valid objections to its use are the high cost of the gas and the added expense of the anesthetist's fee, which for some patients makes its use prohibitive.

GLEENWOOD BLOCK, MAIN ST.

References.

Davis, C. H.: *Am. Jr. Surg.*, Oct., 1916.
Heaney, N. S.: *Surg., Gyn. & Obs.*, Sept., 1915.
Allen, H. C.: *North Amer. Jr. Homeopathy*, Nov. 1914.
Lynch, F. W.: *Ill. Med. Jr.*, April, 1915.
Smith, A. L.: *Neb. State Med. Jr.*, Jan., 1918.
Rines, A, E.: *Amer. Jr. Obs. & Gyn.*, March, 1922.
Ehrenfest, Hugo: *Amer. Jr. Obs. & Gyn.*, Feb., 1921.
McKesson, E. I.: *Ohio State Med. Ass. Jr.*, 1919, Vol. XV, 422.
Guedel, A. E.: *Amer. Year Book of Anes.*, 1916, Vol. I, p. 227.

SPINAL ANALGESIA IN OBSTETRICS, INCLUDING CESAREAN SECTION; OR PAINLESS CONSCIOUS CHILDBIRTH.*

HARRY THEODORE COOKE, M.D.,
LOS ANGELES, CALIF.

The object of this paper is to present to you the proposition of *painless conscious childbirth.* The means by which it can be accomplished, and a brief report of cases in which it has been used.

I wish to state that while on service in the Los Angeles County Hospital as Chief Anesthetist, during 1917 and 1918, I gave 966 spinal analgesias for everything that could be operated on below the diaphragm; so that I am now giving you my own conclusions as the result of this experience. The inception and conception of the possibilities of spinal analgesia in obstetrics dates back to March 1, 1918, when a male patient, aged 28 years, presented himself for operation for prolapsed rectum; he was asked to strain down as in defecation, which he could readily do, and this demonstrated to me the use of the abdominal muscles during analgesia; later analgesia was evidenced by the use of the cautery without

*Read during the Joint Meeting of the American, Pacific Coast and California State Anesthetists, at the Hotel Stewart, San Francisco, June 22-26, 1923.

pain or flinching, and I exclaimed at the time: "Why could not a woman do that in childbirth and have no pain." My later clinical work is a demonstration of the correctness of these ideas and conceptions, and that the pain in childbirth can be blocked off and delivery aided by spinal analgesia.

My first obstetrical case was delivered just eight days later, on March 9, 1918, in thirty-five minutes, including a low forceps delivery, the placing of sutures, and all *without pain*. In fact the woman turned to me one-half minute after injection and said: "Why, doctor! my pain has all gone." I said to her: "I know it has all gone." She said: "My! what a relief."

1. NATURE'S PROTECTIVE PAIN SENSE.

Pain is a protective nerve reflex, prepotent in that its inhibitory effect on other reflexes is more marked than that produced by any other quality of stimulus. For this reason the pain of the stretching tissues in childbirth frequently reduces the size of the outlet, also the contractive and expulsive power of the upper uterus and prevents the forcible use of the abdominal muscles.

(a) *Its Abolition by some form of Anesthesia or Analgesia.* Now when a surgeon decides that an operation will remove disease, he first has to overcome this protective pain sense by some substance that prevents the normal reaction of the body in response to injury, by some method of general, local, or regional anesthesia, before he can proceed. So the obtunding or obliteration of this pain, and the shortening of the time of parturition is our problem; and it is accomplished by taking away the resistance to the "powers of labor."

2. THE UTERUS.

If we can study or regard the uterus from the standpoint of a sac or receptacle to hold something, its ability to increase in size as its contents grow larger, and also later as a sac that has the ability to contract and force out its contents and return to its original size, and to repeat this process at more or less regular intervals during the life of a human being; we have in brief the functions of the uterus. The uterus, therefore, is a very wonderful muscular sac. Now these functions and peculiarities being known, the anesthetist and the obstetrician can take advantage of these conditions as will be shown later on.

(a) *Its Innervation.* The uterus is usually considered as a whole in the anatomies and dissection books, in describing its innervation; but, in my opinion, the fundus and the cervix are distinct and different in their function and innervation by the clinical results that I have been able to obtain; therefore, the uterus should be dealt with as upper and lower uterine segments. The upper body and fundus compose the upper uterine segment and are innervated from the sympathetic system and its own intrinsic and involuntary centers, the lower body and cervix compose the lower uterine segment, and are innervated from the cerebro-spinal system, which is sensory and motor, as are also the muscles of the floor of the pelvis, the vagina and the perineum; which constitute the birth-canal; and the sharp line of demarkation of innervation and opposite function, I have placed at Bandl's ring, or contraction or retraction ring, as you choose, which is probably best placed at the firm attachment of the lower uterine body to the peritoneum; up to which point the cerebro-spinal system of sensation and motion extends. That the sensory nerve fibers come from the spinal cord is shown by the painless delivery of paraplegic women. There is also an independent nerve center in the uterus because the organ reacts when removed from the body. The vascular system is under involuntary nerve control.

I do not believe that there is nerve connection between the mother and the child, consequently the child is not affected when the mother's pain sense is inhibited or blocked off; which is the big outstanding feature in favor of spinal analgesia, not found in any form of general anesthesia, and the child cries as soon as born and is *not* anesthetized. So much for the suggestion of the anatomical distribution of uterine innervation from a regional standpoint. In another article, (*Southern California Practitioner,* September 1920), I go more into detail and quote others to substantiate my views.

(b) *Its Antagonistic Functions.* The cervix and lower uterine segment are cerebro-spinal or sensory and motor and the fundus and upper segment are involuntary. The only time that these tissues are in harmony, or are both contracted, is when the uterus is empty or passive and inert. As soon as the uterus becomes at all active they are in opposition to each other, one contracts, while the other dilates.

(c) *Clinical Findings.* We know that during menstruation the uterus enlarges, and frequently clots form in it, this requires upper uterine contraction to force the clot through the contracted cervix—*opposite functions;* also in pregnancy the cervix and lower uterine segment are in tonic contraction, holding the cervix air-tight and supporting the increasing weight of the child, while the upper segment and fundus is dilating and enlarging,—*opposite functions,* and consequently of a different nerve control.

The cervix, I take it, has a function similar to that of the sphincter ani, *namely* that of holding back material above it, whether it be menstrual flow, clots or the products of conception; and is in tonic contraction until it is forced to relax by the co-ordinate powers above it, which are the "powers of labor," or the contracting upper segment, the weight of the child, and the co-ordinate force of the abdominal muscles. We have here then two opposing forces again; but the tissues that were formerly dilating are now contracting.

A muscle has but one function, that of contraction; when it is relaxing it is inert; consequently another muscle is necessary to oppose it, to secure function, (usually to move a joint) as flexors and extensors of the arm; and this you will concede requires separate nerve control. By this deduction it would appear that the upper and lower uterine segments are under different nerve control. Consequently by nerve inhibition or nerve blocking I aid the relaxation of the lower segment and cervix by depriving them of their contraction power, which at the same time also takes away the sensation of pain, a thing very much to be desired at this stage.

PREGNANCY.

Usually this is self evident at term.

(a) *Diagnosis of Condition.* Is it normal or abnormal? Is the presenting part cephalic, podalic, breech, shoulder or otherwise?

(b) *Causes of Pain in Childbirth.* This pain is caused by the forcible dilation of the contracted lower segment, the cervix and the muscles of the floor of the pelvis, the vagina and the perineum. It is necessary to differentiate pain, which is human distress, from upper uterine contractions, which are painless, as evidenced by Cesarean section under local anesthesia.

There is no response to injury in the upper uterus, and local injection is not needed; but the real pain is in the forcible stretching of the lower uterine segment, cervix and birth-canal below; and the force that causes this stretching of these tissues is the contracting upper uterine segment, the weight of the child and the co-ordinate force of the abdominal muscles. We must differentiate between a labor pain (so called) and the distress of forcibly stretched tissue; as in the passage of a large constipated stool, the pain is not necessarily in the contraction and expulsive effort of the muscles of defecation, but in the extreme stretching of the tissues; the protraction is sometimes caused in constipation by the stool not being low down enough so that the forces of defecation can be advantageously applied. So also in labor, in the presence of an abnormally contracted pelvis, non-engagement, transverse position or excessively moulded head, the dystocia is increased, and the "powers of labor" cannot be advantageously applied and need assistance.

(c) *Its relation to Anesthesia.* In labor the upper uterine segment thickens in contracting, and at the same time the lower uterine segment thins out in relaxing. I am going to ask you to look at childbirth from a somewhat different angle than is commonly presented, by considering the opposing forces, and through analgesia or nerve blocking, to remove the pain and relax the tissues and thus aid delivery.

ANESTHESIA.

(a) *General.* Including the whole body, such as chloroform, ether, nitrous oxid-oxygen or scopolamin-morphin, all nerve depressants, circulating in the blood-stream of both mother and child.

(b) *Local.* By injection, usually of a circumscribed area, as with novocain.

(c) *Regional.* Blocking off an entire region of the body to include the operative field. Known also as nerve blocking; also used in dentistry by means of injection of novocain. Used also in paravertebral, sacral and spinal analgesia.

The latter method of spinal analgesia, or nerve blocking, by intra-arachnoid injection of tropacocain or procain and novocain is the method of our choice in this paper, without the loss of consciousness, a nerve inhibitor, not a circulatory anesthetic.

Regional analgesia is a form of local analgesia that through nerve blocking will desensitize a region of distal or peripheral distribution, below the blocked or injected point, for a given time. Now in order to best accomplish this it is necessary to know where the innervation is coming from that supplies sensation to the part that you are considering; how long will it take to accomplish the work that you are going to do; where to block those tissues and the dosage to use in reference to the time required. These are our problems, and nerve blocking can be very satisfactorily used in their solution, if you understand these problems, and how and why to vary the technic.

SOME ANESTHETIC POSTULATES.

(1) *Know* the anatomy, innervation, physiology and the extent of the pathology in the operative field!

(2) *Know* your anesthetic agent, its possibilities and limitations in the human body!

(3) *Know* WHERE your anesthetic agent is going to exert its influence!

(4) *Study* the problems presented by each individual case!

(5) *Conserve Life!*

(6) *Prevent Pain!*

(a) *Technic.* The dry contents of a sterile ampule of novocain are poured into an empty, sterile syringe and the plunger pushed down upon it. A spinal needle with obturator inserted, is pushed between the vertebrae of the lower lumbar region, into arachnoid space until, on withdrawal of obturator, spinal fluid starts to flow. The loaded syringe is attached to the needle and the contents dissolved in spinal fluid, and the fluid reinjected around the cord. Analgesia starts in less than one minute and is well established in less than five minutes, during which time the patient can be put up in stirrups and prepared for delivery. This form of analgesia takes away the senses of pain and temperature, but not entirely touch sensation, and interferes with motor control of the muscles involved, thereby securing complete relaxation and desensitization of the entire birth canal.

(b) *Relation to Kind of Delivery.* A diagnosis of the patient's condition is necessary to properly vary our technic and apply it to the various conditions of spontaneous, breech, version, forceps or Cesarean section deliveries.

(c) *Variations.* A spontaneous case usually delivers unaided inside of two hours.

A *breech* case is one of the most rapid, as soon as a foot can be grasped. This is a mechanical case, with no effort on the part of the mother, and is usually accomplished in less than fifteen minutes from time of injection.

A *forceps* case is also mechanical.

A version case has been accomplished in twenty-seven minutes, also a mechanical case; the mother makes no effort, is fully conscious but without pain.

A *Cesarean* section is purely abdominal and mechanical, and has no reference to the lower uterine segment or the birth-canal dilating or relaxing, and needs higher desensitization, and has been completed in from fifty-five to seventy-five minutes, including sterilization, which is usually done in these cases; and in one case appendectomy also.

PAINLESS CONSCIOUS CHILDBIRTH.

(a) *Case Reports.* The time mentioned is from the nerve blocking to the birth of the baby. For the sake of brevity in this report of twenty-five cases, delivered by this method, I will group them as follows:

Spontaneous	deliveries	 6	....35 to 120 minutes
Forceps	"	13	....16 to 140 minutes
High Forceps	"	 1	....30 minutes
Breech	"	 1	....15 minutes
Version	"	 2	....27 to 30 minutes
Cesarean Section	"	 2	....55 to 75 minutes

Both Cesarean cases included sterilization by resection of both Fallopian tubes, and the longer case included appendectomy. One case was allowed to run on for two hours with the idea of delivering spontaneously but the molded head was slow in delivering and the analgesia beginning to wear off, forceps were put on and the case delivered in the last twenty minutes. The average delivery time of the other twelve forceps cases was thirty-three minutes. One non-pulsating prolapsed cord caused one stillbirth in this series. The ages ranged from 18 to 42 years, and the women were both prima and multipara. Purposely from the standpoint of hemorrhage after delivery, and to test the contraction power of the upper uterine segment, also the autonomic or involuntary contraction of the vascular system independent of the nerve blocking, desensitization and relaxation of the birth-canal, *no* pre-or post-delivery medication was given, in most all of these cases. This has abundantly demonstrated my original conception of the possibilities of this method, and of its dependability and safety in its use for the relief of human distress. The delivery time includes scrubbing up the patient, putting up in stirrups and draping, and in a few cases catheterization, all of which takes at least ten minutes or more off the delivery time. A woman can have a baby without pain by this method any time in the last month of pregnancy, if it becomes necessary for delivery, as in influenza, pneumonia, eclampsia or blood-pressure cases; and it is the most rapid method known to empty the uterus, as my cases show.

SUMMARY.

In summarizing, the following facts are apparent:—

(1) Nature's protective pain sense can be overcome by this method.

(2) The antagonistic functions of the upper and lower uterine segments are apparent.

(3) Each of these tissues are differently innervated.

(4) This method can desensitize and relax the entire birth canal, and thus aid in a painless and an easier delivery.

(5) The uterus is a muscular sac; the upper portion dilates and relaxes while the lower portion is contracted during pregnancy.

(6) In childbirth these conditions are reversed in active labor; the upper part thickening and contracting, while the lower part is thinned out and forced to relax ,to allow the child to pass through the birth-canal.

(7) The upper part of the uterus is innervated by

the sympathetic system, and its own intrinsic and involuntary nerves.

(8) The lower part and the birth-canal are cerebro-spinal innervated, which is sensory and motor.

(9) Block off the spinal innervation to this birth-canal and we have a shorter easier labor with no more pain in spontaneous deliveries than that of defecation; and in mechanical deliveries, no effort on the part of the mother is needed, all saving time and distress.

(10) Nerve blocking must be varied to suit the kinds of delivery.

(11) The more pathological the patient's condition the more outstanding is the preference for this method; as in pneumonia and eclampsia cases.

(12) This is the quickest method known to empty the uterus painlessly.

(13) It adapts itself to all forms of operations below the diaphragm, as well as obstetrics, as I have used it in over one-thousand such cases.

(14) Spinal injection or nerve blocking is *painless* because the resisting tissues causing the pain have been desensitized by its use and relaxed, and the baby can be much more quickly delivered because the resistance to the contracting fundus has been removed, and the patient is comfortable.

(15) It is a *conscious delivery* because the body only below the diaphragm has been blocked off; no general anesthetic has been given; your patient can talk to you and co-operate with you and follow your directions.

(16) She can have sups of water, coffee, ice etc. for refreshment and after delivery can return to bed and eat as nothing has been done to upset her stomach to hinder digestion, as with ether or chloroform.

(17) This is not a circulatory anesthetic but a nerve inhibitor.

(18) There is no nerve connection between the mother and the baby; and as only the mother's pain sense has been dulled or obliterated, the baby has not been touched by the nerve blocking and it cries as soon as delivered, and we know that the baby will live and has *not* been anesthetized.

(19) We have here a very definite aid to delivery suitable for every known procedure in obstetrics.

(20) The relaxation is complete, and there are no tears due to pain contraction reducing the size of the outlet.

(21) Lacerations, if there are any, are due to abnormality in size of child and would be inevitable with any method, but can be repaired at once without pain.

(22) This method is brought to your attention in the interest of humanity and the babies that are yet come and for the relief and comfort of the women upon whom the burden of childbearing is imposed.

1408 FULLER AVE., HOLLYWOOD.

MEDICO-LEGAL AND OBSTETRICAL OBSERVATIONS ON SCOPOLAMIN ANESTHESIA.*

E. HOUSE, M.D.,
FERRIS, TEXAS.

Scopolamin is a very unusual drug, and one of far reaching possibilities. Its sphere of usefulness represents many fields of endeavor, amply proven by material facts. I seek no honor, I named the technic, I adopted, the *Florence-Rosser Method.* Far be it from me to offend the most sensitive man present; nor is it my pleasure to be disrespectful to Dr. Steinbuchel, the discoverer of *Twilight Sleep.* I respect every man who has added his mite, to aid in solving this problem, but it is my individual opinion, that morphin inhibited the progress of scopolamin anesthesia in obstetrics. Time will not permit me to enumerate all of my experiments, but suffice it to say, I convinced myself that morphin was absolutely unnecessary, and was, furthermore, contraindicated when combined with scopolamin for use in obstetrics.

The bone of contention has always been the morphin, but instead of looking around for some other drug, it seems by common consent, the morphin has been moved up to the beginning of labor. The only answer could be, that there may be fewer chances of harm resulting from its use. Again, permit me to ask, if morphin will produce spasms in the newly born baby, why then incur the unnecessary risk with the unborn baby. I have held addicts under the influence of hyoscin for over two weeks, I have held women under the influence of scopolamin from the beginning of labor, and can, therefore, state, that prolonged labor does not demand morphin as a narcotic, nor will small preliminary doses of morphin prevent nervousness.

THE FLORENCE-ROSSER METHOD.

A brief description of the Florence-Rosser Method makes it imperative that I omit, all of the variations from the average. Fifteen per cent of cases will require a larger dose of scopolamin while five per cent will necessitate a smaller amount of the drug.

When dilation is manifested, I administer scopolamin gr. 1/130 plus apomorphin grain 1/50 to

*Read during the Joint Meeting of the American, Pacific Coast and California State Anesthetists, at the Hotel Stewart, San Francisco, June 22-26, 1923.

1/60. If pains are fast, I wait fifteen minutes, if pains are slow, I wait twenty or thirty minutes to inject scopolamin grain 1/200. In twenty minutes absorption should be complete, and more so in thirty minutes. I then administer chloroform, which was selected after a careful comparison with gas and ether. I have the patient count after me, slowly, and in a loud voice, to divert her mind from hallucinations until she can no longer count. The chloroform quickly produces unconsciousness in such a patient, and its use is then discontinued.

When the chloroform is removed, the patient quickly passes into the stage called *amnesia,* and the manifestations of the amnesia can only be estimated from experience. I never permit the nervous phenomena of some patients or the conversation to influence me while they are in the throes of a labor pain; but I do note most carefully, the condition of her mind in the intervals, between pains. If I decide after thirty minutes, that the stage of amnesia is not satisfactory, I again administer chloroform and again invite the patient to count after me. The number she reaches tells me accurately the condition of her mind, and guides the selection of my next dose of scopolamin.

I make scopolamin and chloroform equal partners; both can do the same work, but each one can do some part of the work more satisfactorily than the other. It is difficult and slow and requires large doses of scopolamin *alone* to produce unconsciousness, but it is very easy for scopolamin to hold the cerebrum depressed, when the synapses are contracted by chloroform; furthermore, the smaller amount of scopolamin you are required to give in obstetrics, the less trouble you are likely to invite. Chloroform is condemned by northern physicians, for they maintain it destroys the internal cells of the liver. The small arount of chloroform required, and the intervals between its use, makes it a small issue to discuss. Investigation has shown these two drugs are similar in their effect upon the nervous system.

The only danger to anticipate is the effect of the drug upon the baby. You cannot get away from the fact that the baby will be as drowsy as the mother. To prevent the *blue baby,* inject strychnin sulphate grain 1/80, deep into the abdominal muscles of the expectant mother, five minutes before delivery is anticipated. The dose of strychnin being small, it is quickly destroyed. Babies are very sensitive to the effects of strychnin, so this size dose was selected, only, after many careful tests. When the head passes over the perineum, again allow a few inhalations of chloroform, as every mother loves to tell "she did not remember when her baby was born".

The baby leaves a temperature reputed to be one hundred and five degrees. At the moment of delivery, have the room warm, and a hot blanket ready. If you will instantly wrap it in the hot blanket, hemostat, cut the cord, then establish regular breathing, there is no reason to anticipate any trouble with the baby, so far as scopolamin is concerned. I consider scopolamin grain 1/60 the limit of safety, if that amount (where apomorphin and chloroform is used) is not sufficient for the purpose desired, I permit the patient to appreciate the extra pain. No physician can violate the laws controlling the dose of scopolamin and go unpunished. In closing this topic, let me persuade you not to consider sleep, but concern yourself about the alleviation of pain. There is no barrier against the use of scopolamin, that is either formidable or insurmountable, all that is required is caution, patience and individual achievement. In the scope of its value and the quality of its offering, scopolamin must, like ether for surgery, have been provided for the expectant mother.

I invite you (not in a spirit of egotism) to make a comparison of the *Florence-Rosser method.* You would observe the physiological effects, noted in the present day technics and the requirements are, one-third to one-half the amount of scopolamin. You will obtain the same type of anesthesia in forty minutes. The apomorphin is far superior to the morphin, a fact to be observed by one trial. The strychnin, as you all know, is an antidote for any drug which contracts the synapses of the dendrites of the cortical cells, hence the *blue baby* only needs stimulation of the pneumogastric nerve.

Scopolamin in obstetrics will never become universally used, until some progressive medical college offers a chair in their institution to the physician who can demonstrate to them that his technic is not only safe, but is superior to every man who demonstrated before them.

The Associated Anesthetists might invite upon themselves this grave responsibility and thus give to the motherhood of the world *a painless parturition.*

SCOPOLAMIN ANESTHESIA IN CRIMINOLOGY.

Scopolamin anesthesia in criminology was presented to the medical profession by me as a harmless and humane *third degree,* a method to secure from the mind, against its will, the stored contents called *memory.*

This method offers to the criminal investigator a new and a powerful weapon to further the ends of justice. Scopolamin has been erroneously, though

on his part honestly, termed *truth serum* by W. W. Ferguson of the *Los Angeles Record*. The name is a misnomer like *twilight sleep*.

The principle involved in the use of scopolamin in this direction is based upon recognized physiological functions of the brain and these clinical observations. The brain's most powerful center is hearing. It is the last center to succumb to an anesthetic and the first to function after discontinuance of an anesthetic. I have observed (and this is strangest of all to me) that the center of hearing can, and does, make the other four centers function before these centers are influenced by their own special nerve (original).

The only function the auditory nerve possesses, when stimulated by a question, is to carry sound waves to the auditory center, and the only function the auditory center has is to evoke memory.

Under the influence of scopolamin as advised, a criminal is rendered oblivious to existence; appreciation of environment is eliminated. The will power is non-existent. In such a state of unconsciousness, if subjects are engaged in conversation, the moment they can hear, at the moment the auditory center asserts its power, there need then be no doubt but that their reply will be the truth. They are too helpless to protect themselves by inventing lies to questions propounded.

In the House's *receptive stage* the answer to a question is the product of cerebral integration, and is not due to impressions stored away in isolated places. Make a subject correctly interpret, in the auditory center, the meaning to a question, and the answer comes from stimulation of that part of the brain where memory can be produced. It is, therefore, important in the use of scopolamin in criminological practice, to exercise caution and patience. Also to have experience in promptly framing the question. Subjects will forget the first part of a question, unless the query is presented in a short, concise manner, representing the thought to be transferred, in the fewest possible words. All questions should be presented at least three different times for corroboration.

I cannot hope to win your confidence without producing data worthy of your respect, hence the following letter:

Dallas, Texas, Feb. 5, 1923.

Gov. Pat. M. Woff,
Austin, Texas:

Dear Sir:—I want you to help Dr. House in his experimental work. He has been conducting experiments in the Dallas County Jail, and he has obtained the results he sought for. At first I put no credence in his discovery, but I must confess his results have won my confidence. I am anxious to see him finish his experimental work at Huntsville, Texas, where material is sufficient to prove his contention beyond dispute. I trust you will grant him this permission, as he proposes to use only volunteers.

Very respectfully,
DAN HARSTON,
Sheriff of Dallas County.

My clinical findings to date are as follows: My first test proved that a man was sent to the penitentiary for fifteen years for a crime he did not commit. My second case was a man given fifteen years for murder, the case was on appeal at the time. His testimony was investigated by the district attorney to satisfy his curiosity. It was found the man was in Oklahoma at the time the murder in Dallas was committed and the case was dismissed without trial. The next three cases were for the Burns Detective Agency at Dallas and the result was as follows:

This is to certify that in August, 1922, Dr. House walked in my office, a stranger, and stated, he could place a man under the influence of a drug and make him answer correctly any question asked. He desired the influence of the Burns Agency at Dallas, and inquired if I would give it to him if he permitted me to conduct the test in my own way. I will not express my opinion of him at the time, but I did accept his proposition for what it might offer. To make the test reliable, I selected three men and gave to Dr. House a list of twenty questions without the answers. The men understood they were to give wrong answers to prove the test unreliable. I desire to briefly state, that Dr. House not only obtained the correct answers to the sixty questions, but the answers to many more, to complete the demonstration, that a man under the influence of the drug is absolutely at his mercy. I, therefore, desire to express my entire confidence in the method as used by Dr. House.

H. G. MOORE,
Asst. Mgr., Dallas Office.

The next four cases were also private demonstrations for physicians, lawyers and laymen, and similar letters state I obtained the correct answers to every question, possibly two hundred or more. My next three cases were held in the Dallas jail, and were for the purpose of trying out three different methods. I investigated one case, as it invited my sympathy. I convinced myself the boy was sent to the penitentiary for a crime committed by his chum. I later talked with him in the penitentiary, which confirmed that opinion. I made no effort to obtain a pardon, as he concealed the crime. The other case was a highjacker. His indictment was dismissed. The assistant district attorney, who assisted me, told me later he was convinced the boy was innocent. The third case was a negro, and the jailer told me the evidence I obtained was all found to be correct. I also heard he was convicted, but I cannot say if he had a lawyer.

When I received the invitation to present my findings to the Associated Anesthetists, I advised with Sheriff Harston, of Dallas. He gave me two cases and promised to personally investigate my data. One was a Czecho-Slovak Jew, who presented a strong alibi, and he did not believe I could make him tell

the truth, but he does now. He told in detail his part of the robbery, and the names and part each of his associates played. All were convicted as his testimony was corroborated.

ILLUSTRATIVE CASE REPORT.

I have selected the last case to report in full. I hope it will prove as entertaining to you as it was interesting to me. The subject was given first scopolamin grain 1/130, in fifteen minutes he was given scopolamin grain 1/130 plus apomorphin grain 1/40. In fifteen minutes he was given scopolamin grain 1/200, in twenty minutes he was chloroformed to complete unconsciousness. At the end of twenty minutes he was given scopolamin grain 1/200, because he was not in a sufficiently deep stage of narcosis. The subject reached the receptive stage in two hours and ten minutes. I questioned him for one hour before he reached the stage of amnesia, where memory islands can be noted. It was proven in this case what I strongly maintain is essential, *viz,* that a subject should not remember any questions that were asked nor any answers given to a single question presented to them.

Replies elicitated in this test, gave the following evidence: Name, Albert Head; age, twenty-one years; born at Little Rock, and lived in Dallas six years. Mother living, and father died of tuberculosis. First committed robbery in Tampico, Mexico, for the reason he was without funds, and was assisted by a notorious character whose name he gave. They obtained forty dollars in money and some pistols. His next robbery was a jewelry store in New Orleans. He worked alone, gaining entrance through skylight. He told in detail the disposition of diamonds, manner of arrest and trial. He described how he bought his morphin in Dallas, and that evidence was found by the federal officers to be correct. He told of selling stolen goods for two women shop lifters and gave their names, and that evidence was also correct. He stated he was arrested for an automobile theft, admitted he was in the deal, but did not himself drive off the car. He gave the names of the three state's witnesses (one of them a Dallas policeman) as his associates who did steal the car. He explained fully how the car was stolen, the policeman noting the man went off leaving his keys in the car. He explained fully their scheme, but could give no reason as to why his pals framed up on him.

When Head's trial came, I attended for the purpose of reporting his case to you, he had no lawyer and no witnesses. I saw my only chance to verify his contention under the drug was to furnish him a lawyer, who might use my evidence to confound the state's witnesses, as I had his description of each one's part in the theft. In that way I might prove, the test was a failure, or the other men were guilty, as Head had affirmed under the anesthetic. Without expressing my opinion, I will say the trial jury acquitted Head on the first count of driving off the car, and gave him a five year suspended sentence for concealing the car, maintaining he was no more guilty than the other three.

The three state's witnesses fooled the grand jury for their own protection, but they did not fool the trial jury, who were permitted to hear the contradictory statements of the state's witnesses made in reply to the unexpected questions I furnished to Head's lawyer. I believe Head's conviction would have been certain had he not taken scopolamin. To corroborate this opinion, the following letter is offered:

Dallas, Texas, April 19, 1923.

In re the State of Texas vs. Albert Head, charged with automobile theft, I desire to state his acquittal by the Trial Jury was predicated to the facts—obtained by Dr. House, while Head was under the influence of a drug.

(Signed) SHELBY S. COX,
Criminal Dis't. Att'y. of Dallas Co.

In the light of my seven years of criminal research work, I offer the following conclusions as being possible of attainment:—

First—Any person arrested as a suspect can be made to acquit or convict himself.

Second—There would be no further necessity to grant immunity to a known criminal for the reason his evidence could be obtained and corroborated without his consent.

Third—A perjurer, at the command of the judge, could be made to tell the facts as they exist in their mind, in other words the truth. I ask you, how many women have sworn away their honor falsely?

Fourth—In times of war a spy could be made to divulge his information before being tried.

Fifth—Statistics say that only one person in ten who are tried is convicted. The nine who escape from lack of evidence would show under the influence of the drug those who were guilty.

Sixth—Statistics show that one-third of the arrests made are a mistake. It is from this class that the innocent in the penitentiary are recruited.

Seventh—Statistics compiled give over one-half of the expense for maintaining our government as being spent for the control of crime. If Uncle Sam could prove this theory, in the hands of trained men, as reliable, it would mean the savings of millions of dollars a year.

Eighth—Its adoption as legal, to be used only by criminal investigators, would do more than any one method to prevent gang robbery. Criminals would

soon learn the arrest of any one of them would mean the names of all of them.

Ninth—It would do more than any other type of *third degree* to obtain confessions. For this very reason many would prefer to confess than to take the medicine.

Tenth—Statistics say that there are five per cent of innocent persons in every penitentiary. If this method could be standardized it would clean every penitentiary of their innocent, and furthermore there would be no more innocent persons sent there.

CONCLUSIONS.

At the first reading this all sounds as miraculous, absolutely impossible and like the hallucinations of a diseased mind. If you will stop and reflect, with your knowledge of medicine, you will understand that all I have said as being possible represents only one simple function of the drug.

Each type of crime does not mean a different function of the drug, but it does mean, under the influence of the drug, you can play with the memory of the person, therefore, each crime requires only a list of questions pertaining to that crime.

If the medical profession demands scopolamin to be one hundred per cent perfect they must demand of the physician to be 100 per cent perfect, for the failure will be his and not the drug's.

If scopolamin would prove reliable in only fifty per cent of cases, it would be worth its weight in radium, and then some. I admit though that the testimony obtained would be worthless in a court room, but the evidence secured by any type of third degree must be corroborated. The use of scopolamin anesthesia will never become legal unless it receives the approval of the medical profession, and even the A. M. A., with all of its associated branches, can not make its use legal, without inviting outside aid. The criminal lawyers, people who are criminally inclined and the criminal element will all have to be defeated in the legislative halls.

My attempt, of course, is to show that I cannot influence public opinion alone. If this theory is worth anything at all, it is worth much. I am not financially able to carry my investigations any further, therefore, as you have all my clinical findings to date, I present to you the opportunity to take the initiative and, if it is your pleasure, I will help you to translate my idea into effective action or to prove its unreliability.

My sympathy has been aroused by letters from men maintaining their innocence. I will read one to see why—help should not be permitted to such a man. He may be guilty, but the point I want to bring out is: The law should concern itself with the acquittal of the innocent with the same intensity as it demands the conviction of the guilty.

Leavenworth, Kansas, Oct. 22, 1922.

Saw an item in paper as to Twilight Sleep vs Truth Serum. My brother and I are doing twenty-five years for a train robbery at Edmond, Oklahoma, Sept. the 28th, 1921. A crime we are not guilty of, and never knew nothing of. We are both ready and willing to take the serum and have the Warden here question us in regard to this crime. We fear not as we are not guilty. If you know of any way whereby you could get permission to put your medicine to a test, we will surely submit gladly, if the Government Officials will permit. We are both family men. I was in the grocery business. One man here, I never saw in my life until we were arrested for the crime. May God forget me, if I tell not the truth. Now, Doctor, if you know of any way, we can be given a chance, we will very much appreciate it.

Yours truly,

DAN O. DUREE, No. 17340.

Dr. E. H. Skinner, following the instructions of a resolution voted by the Medical Association of the Southwest, made a powerful appeal for this permission to Attorney General Daugherty. I also sent a copy of this letter, asking only for this test. There was no reply from him to either letter. A representative of the Associated Press informed me that if I would call upon them they would put me in any penitentiary I desired to work in. I informed him I would be censured for such a course, as the Medical Society reserved these privileges for themselves.

In conclusion, I will say with Dr. Gauss, "The trouble is not with *truth serum,* but to the mistakes made in its name." Yet I feel any humane method, which will assist in acquitting the innocent and convicting the guilty, is indeed worthy of the consideration of every Christian man and woman, and should concern more so above all the other branches of classified science *the great medical fraternity.*

Box 187.

ASSOCIATED ANESTHETISTS OF THE UNITED STATES AND CANADA

1923—MEETINGS—1923

Second Congress of Anesthetists
N. A. R. S., Interstate & Mid-Western & Chicago Anesthetists

Chicago, October 22-24, Auditorium Hotel

Southern Association of Anesthetists

Washington, D. C., November 12-14, Burlington Hotel.

SELECTIVE ANESTHESIA FOR MOUTH AND JAW SURGERY.*

FRANK CHANDLER, D.D.S.
LOS ANGELES, CALIF.

It is truly an honor to be invited to come before the Associated Anesthetists to explain, in a short space of time, the choice of anesthetists of the extracting specialist, and in doing so I want to state at the outset that my remarks are based entirely upon my own experience.

Among the greatest benefactors to suffering humanity are the discoverers of anesthesia. The two most prominent were Horace Wells, a dentist, who claimed to have discovered anesthesia by the inhalation of nitrous oxid at Hartford, Connecticut, in November, 1844, and William T. G. Morton, a dentist, who claimed to have discovered anesthesia by the inhalation of sulphuric ether in Boston, Massachusetts, in September, 1846. Then, from the dental profession have come these two anesthetics and from the dental profession the greatest development of nitrous oxid, and oral surgeons have been and are its greatest users.

Thomas, an oral surgeon, of Philadelphia, gave, before he retired, 298,000 nitrous oxid anesthesias —the majority of them long before oxygen was given concomitantly — and this remarkable series without a fatality. The dental profession has also given us among many others, Chas. K. Teter, who is one of the greatest anesthetists, and who has done more for nitrous oxid than any contemporary I know of.

THE ERAS OF OXYGEN AND NERVE BLOCK.

Oxygen first was used in combination with nitrous oxid in 1868, and credit for this discovery belongs to Andrews and Clover, of Chicago. The result was a decrease in the popularity of chloroform.

For the more recent scientific development of nitrous oxid in combination with oxygen and with the several agents used either synergistically or as a sequence, we are indebted to the medical profession—to such men as E. I. McKesson, J. T. Gwathmey and many others—to whom both professions should give profound thanks.

From 1884, when cocain was brought forth by Kohler, it was used reasonably successfully until the advent of novocain, discovered by Einhorn in 1905, one-tenth as toxic in the same dose, and not a metabolic poison.

With the development of the field of oral surgery has come hand in hand the development of conductive or nerve blocking anesthesia—the greatest anesthetic in minor and major cases, where local anesthesia is to be obtained, that I know of, restricted in its use, however, to areas not too far advanced pathologically and to those cases where the phychological or physical condition of the patient will allow its use. Homage is due Heinrich Braun, who is called the "father of local anesthesia", and whose technic, as adapted for dentistry by Fischer and translated by Reithmüller, is standard with slight variations by all followers of the novocain block; also to Matas, Corning, Cushing, and Crile, who were his American confreres and contemporaries.

It is a far cry from the turnkey and brute strength to the day of the modern surgical extraction, with previous anesthesia as our present enlightenment permits. The world moves slowly but ever definitely along the lines of the greatest good—intellectually, morally and scientifically—and I, as a member of the dental profession, specializing in oral surgery, most keenly appreciate what constitutes proper anesthesia; the uses we are called upon to make of it; its possibilities and the limitations in the summary of the choice of the several anesthetics that we have at our disposal.

EVALUATING PATIENTS FOR BORDER-LINE ANESTHESIAS.

Since the development of the x-ray, and its common use, has come the knowledge that a great many ills of the human family have their source in diseases of the teeth and jaws. With the appreciation of these causes a new and definite field has developed—that of oral surgery—which includes not only those operations formerly performed by the general practitioner, but encroaches to a small extent at least upon the field formerly covered by the general surgeon, as well as the eye, ear, nose and throat specialist.

Ninety per cent of the operating within the oral cavity is extracting.

The field of the extracting specialist today comprises that part of the oral cavity extending from the clavicle to the zygoma and the area anterior to the tonsils, and specialists in this work are obliged to give border-line anesthesias —that is anesthesias of perhaps five minutes' duration. The difficulties that confront them, I believe, are not fully understood by the medical profession and particularly by the professional anesthetist. Our cases are referred to us, and the great majority of them are driven through pain

*Read during the Joint Meeting of the American, Pacific Coast and California State Anesthetists, at the Hotel Stewart, San Francisco, June 22-26, 1923.

and suffering to seek our services, necessitating immediate interference on our part without a previous appraisal of the physical weakness of the individual.

We do not have the benefit of hospital preparation nor previous medication, except with the relatively few cases that we prepare for in advance, that are long-drawn-out and generally ether-relaxed and synergistically controlled to accommodate surgery more major than minor in its character.

Our diagnoses, then, must be based entirely upon our appraisal of syndromic signs and such knowledge of complexities as our previous experience and education may have developed.

I believe you will agree that it is a much simpler procedure to use a face mask and induce anesthesia for surgery on any other part of the body than it is to maintain anesthesia through the nose and work in the mouth—perhaps of some backwoodsman whom a general practitioner, after breaking a tooth, may have sent to us with a gentle admonition—"Go up and take a whiff of gas and have it taken out." I believe that without doubt the most difficult anesthesia to give (speaking of general anesthesias) is that for open mouth surgery, whether it be for the removal of a single tooth or for surgical interference for whatever cause within the area of the jaws, the teeth and the hard and soft parts connected therewith.

We cannot economically employ a physician to give our anesthetics, and of necessity use trained nurses who have been schooled in the mechanical manipulation of the machines we use, and while their judgment is at no time final, some of our assistants become very capable in the use of nitrous oxid-oxygen in these border-line cases.

Various Anesthetics and Methods.

We are given a fairly wide range in the choice and use of anesthetics. I believe the majority of the extracting specialists and oral surgeons use nitrous oxid-oxygen as a routine practice, either alone or synergistically, and anesthol and paraldehyde given concomitantly with nitrous oxid-oxygen. Personally I believe nitrous oxid is an ideal foundation for general anesthesias and in ninety per cent of our cases we give enough ether to maintain stimulation and obtain relaxation. A successful measure of safety is in this combined technic.

I do not know of an intelligent extractor who would attempt chloroform without a thorough physical examination of the patient, and I would not use it without a professional anesthetist assuming all the responsibility. Ethyl chlorid has no place in my practice, nor has somnoform, as I do not believe they can be classified as real anesthetics and used to meet a standard.

You are all more or less familiar with the technic of both intra- and extra-oral block of the fifth nerve, either through the ganglion of Gasser or through any one of its three principal divisions. In the radical work within the oral cavity, that will allow the blocking of any or all of its several branches or its peripheral areas, and if a field not too advanced in pathological destruction is presented, and where the time element must of necessity be a factor, we use novocain block, particularly in the reduction of fractures of the jaws, in the resection of nerves and in radical antrum work; and where the psychology of the patient will permit of a conscious operation, I believe that novocain is the choice of most operators and allows for a cleaner field and a more deliberate undertaking with less hemorrhage than any general anesthesia.

The standard technic advocated by Riethmüller is two per cent novocain in physiological salt solution; the solutions being freshly made for each operation and under conditions of positive sterility of preparation and injection. Our technic includes the use of irridio platinum needles only and our solutions are injected at, or very slightly above, body temperature. After-pain and sloughing of tissues are in the majority of cases results of stock solutions, conditions of non-sterility, improper technic, or injecting into an area, the pathological significance of which is not appreciated.

Complete and successful block anesthesia is almost a science in itself and I think the extractors perhaps represent the highest degree of technical skill with novocain block of any class of operators. The correct production of anesthesia at any point in the mouth requires a knowledge of anatomy and an appreciation of its ennervation to cope successfully with the conditions that we may be confronted with. The dental profession has given a technic that makes for positive anesthesia and temporary paralysis of the fifth nerve and all its branches, which particularly affect us as extracting specialists.

Selective anesthesia then, in our hands, gives us first nitrous oxid-oxygen, and for those cases that cannot be satisfactorily handled with this, we have ether for relaxation and cardiac stimulation and we have anesthol and paraldehyde for rapid narcosis in the exceptional case. I believe I am safe in saying,

in recapitulation, that ninety per cent of our work—speaking of general anaesthesia—is done under nitrous oxid-oxygen. The average narcosis would not equal or exceed five minutes, and while one and two-hour anesthesias under nitrous oxid-oxygen are sometimes necessary, they are the pronounced exception. All cases showing acute pathological condition, I believe, should be operated on under general anesthesia. Wherever the case in hand justifies it, I believe general anesthesia is to be used, as there is less shock, a more rapid healing of the wound and more satisfactory return to normal after nitrous oxid-oxygen than under any other anesthetic.

SOME LEGAL AND EDUCATIONAL CONSIDERATIONS.

The subject of general anesthesia, from our standpoint, is one of mutual interest. Much has been written and more said as to whether or not anyone but a registered physician should give an anesthetic. A decision of this question in the negative would repudiate some of the greatest anesthetists—men who have given 300,000 anesthesias without a fatality—men who have followed nitrous oxid from its infancy—and I know of many men, not registered physicians, who have given from 100,000 to 200,000 anesthesias, that I would be reluctant to think were not the equal of any physician in a like field.

It is deplorable that there are so few places in the United States where a person can acquire a thorough and comprehensive knowledge of anesthesia, particularly of nitrous oxid-oxygen, and I believe that the use of these agents should be restricted to those individuals who can prove their competency and their knowledge sufficiently to entitle them to be known as anesthetists. While the correct use of general anesthetics is a Godsend to humanity, their improper use is a detriment to the members of the professions who spend their lives in alleviating pain and human ills. You, gentlemen, members of the Associated Anesthetists, may object to the dental profession giving ether as a synergist without a physician in attendance, but if you will pause and consider that chiropractors are now permitted, under the California law, to sign death certificates, I believe you will agree that members of the dental profession, who are specialists in their fields, should be accorded a like privilege. I thoroughly believe that there should be given to dental students the highest degree of medical training and I hope that some time medical and dental education will be on a par and that dentistry will be accepted as a branch of medicine—as it is and should be.

Inducing a satisfactory and tranquil nitrous oxid-oxygen anesthesia embodies more skill, more knowledge and better judgment than the facetious advertising of many gas machine manufacturers might convey. Any drug or combination of drugs that will put an individual into deep narcosis in from two to four minutes is a dangerous plaything if not handled intelligently and with a full and a proper appreciation of the dangers involved and the professional duties attendant. The manufacturers of gas machines have done as much to harm the field of anesthesia as any one factor I know of. They send out salesmen, who have taken a mail order course in nitrous oxid-oxygen anesthesia, and who sell gas machines by telling the buyers—"there is nothing to it"! and then the public is left to the tender mercies of individuals who cannot differentiate pulse variations. Years ago, the old nitrous oxid rule of thumb was—"when they are blue operate, and when they are black call the undertaker" and if we depend upon the advertisements of the average gas apparatus we would be led to believe that the handling of nitrous oxid-oxygen is a pastime to be indulged in by anybody or his neighbor.

The problems of the anesthetist are almost endless and the very nature of their hazard makes them all the more interesting. I hope that anesthesia will reach its highest development through the earnest workers in this specialty and that the public will, in the not distant future, be taught to realize that the anesthetist is not a bogy man but rather a person of kindly mien, who, through his knowledge and skill, controls those agents that lessen human pain and make the world a better, kindlier place to live in.

Membership in the Associated Anesthetists has meant a great deal to me and I have learned much, and the road ahead, I hope, is long, and I know is filled with knowledge to be gained from experience.

Before closing I want to decry this wave of propaganda that hits all of us—for measured technic, when there is not any such thing—for standardized technic for the administration of any drug so lethal in its possibilities, so profound in its action, yet so wonderful and such a Godsend to those who otherwise would have to suffer. In closing, may I add that I think if we specialists of the dental profession, who are trying hard to do well the work of our choice, are accorded a greater intimacy into the medical field, we will at least try to learn and not to be a discredit to our benefactors.

6380 HOLLYWOOD BLDG.

THE PRE- AND POSTOPERATIVE CARE OF SURGICAL PATIENTS: WITH ESPECIAL REFERENCE TO THE HAZARDOUS RISKS.*

R. F. HASTREITER, M.D.,
LOS ANGELES, CALIF.

It has been with no small degree of pleasure that the writer has observed a growing tendency on the part of a few surgeons to cooperate and counsel with the anesthetist, with reference to estimating the ability of the patient to withstand surgical trauma, and in the preparation of such an individual for operative intervention.

The neglect on the part of the anesthetist and surgeon to determine before hand the surgical expectancy of the patient, and the unscientific management of the preoperative stage, have undoubtedly been responsible, in the past, for many of the complications and fatalities surrounding surgical operations.

UNTOWARD PHYSIOLOGICAL EFFECTS.

Experimental efforts by careful observers have shown conclusively that anesthesia, coupled in many instances with tissue insult, leads to certain definite changes in the physiological activities of the individual, such, as for example: a decrease in the plasma bicarbonate; a reduction of blood volume, with a lessened output of catalase by the liver and considerable destruction of blood catalase with a resultant decrease in oxidation and an increase in acidosis, the degree dependent upon the anesthetic used; a lowering of the carbon dioxid capacity of the blood in the presence of an ether hyperpnea, when the strictly open method of anesthesia is employed and a vasodilatation of the peripheral vessels, which in the presence of organic heart lesions may result in a marked lowering of the blood pressure.

ESSENTIALS IN PRELIMINARY MANAGEMENT.

With such important knowledge at our command certain preliminary procedures, varying somewhat with the pathological condition of the patient, are imperative, if the best interest of the individual is to be conserved.

The practce of so many surgeons of interdicting food for variable periods, previous to the operation is an extremely common one and is mentioned here only to be condemned.

The average patient should be permitted to have a full and liberal diet, consisting largely of vegetables and carbohydrates up to the night before the operation, this giving a full supply of liver glycogen, a most valuable adjunct in lessening the tendency to acidosis in cases in which the early postoperative administration of food is withheld.

Water, too, especially of the alkaline variety should be given freely to within a few hours of the expected operation.

Catharsis, as still employed by all too many surgeons, is not only unnecessary, but distinctly harmful in that it depletes the system of its necessary fluids, distends and irritates the bowel, prolonging the operation by interfering with abdominal relaxation, thereby predisposing to intestinal adhesions and producing postoperative abdominal distention through its paralysing effect upon the normal intestinal peristalsis.

A low enema, the night before the operation, may advantageously be given, but the usual morning flushings should be avoided, as they disturb the rest of the patient, (5 A. M. being the usual time for this procedure), and have a subsequent inhibitory effect upon the peristaltic activity of the bowel.

That the least possible interference with the alimentary tract is productive of the best results is no longer a matter of conjecture.

A good night's rest is an essential prerequisite for every operative patient and can be easily accorded to the nervous frightened patient by the use of dial, adalin, veronal, or some similar hypnotic.

To relieve the surgical patient of much of the accustomed nervous apprehension, some preliminary opiate such as morphin or pantopon, supplemented with atropin or hyoscin should be given in suitable dosage, from one-half to one hour prior to the operation.

Patients, thus handled, come to the operating room calm and collected, pass under the influence of the anesthetic with little or no struggling, are free from excessive mucus and require far less of the narcotic agent than those from whom such medication is withheld.

CARE OF DOUBTFUL OR HAZARDOUS RISKS.

We shall now consider for a few moments the care of the patient whose pathology is such that they must be placed in the category of doubtful or hazardous risks.

Chronic alcoholics, as McMechan has admirably shown, are subject to untoward complications. The brain, heart, liver, adrenals and kidneys being the seat of pathological changes, and the continuous under oxygenation from which they suffer, leads to a persistent form of acidosis.

*Read during the Joint Meeting of the American, Pacific Coast and California State Anesthetists, at the Hotel Stewart, San Francisco, June 22-26, 1923.

In conjunction with the free use of carbohydrates, fruit juices and alkaline waters for the control of this condition, glucose may be given by rectum or Fischer's solution intravenously when edema or nephritis are present.

Postoperatively, these patients frequently suffer a stormy convalescence; pituitrin being recommended in the presence of circulatory embarrassment; spinal puncture in delirium tremens and alcoholic coma, together with Hogan's mixture (sodium chlorid, sodium bromid and sodium bicarbonate) for its dehydrating effect upon edematous tissue and his solution of glucose intravenously for its ameliorating effect upon the grave acidosis.

For patients with serious forms of *heart disease,* Richardson believes, and in this belief I heartily concur, that both pre- and postoperative attention should be directed toward one common goal, and that is the maintaining of the blood pressure at a point as near the normal as it is possible to obtain for that certain individual.

Cooperation with a competent internist is always advisable; for helpful suggestions along the lines of judicious preliminary medication are in many instances the key to a successful postoperative issue.

Rest in bed, a full diet with an accentuation of the carbohydrates, through alkalization, the elimination of cathartics, full dosage of the selected preoperative opiate, and the elimination of disturbing noises during the period of induction, are factors of the utmost importance in tiding those patients over the crises incident to the anesthesia and operative shock.

Postoperatively, morphin should be given freely for, without doubt, it is the most important drug in our therapeutic armamentarium, in preventing the onset of untoward circulatory depression; pituitrin for its sustaining effects upon the blood pressure, the free use of water by mouth and early resumption of solid food can not be too strongly emphasized in all heart cases.

MacNider in his stricking experimental work on *nephropathic animals,* showing a reduction of phenolsulphonphthalein, with an increase in blood urea, but with a normal alkaline reserve, demonstrated after one hour of anesthesia, that anuria with no response to diuretics and a rapid depletion of blood alkali were induced. Microscopically it was shown that the pathological changes effected, consisted of an acute swelling and necrosis of the epithelium of the convoluted tubules and deposits of a large amount of fat in the descending loop of Henle.

In contradistinction to the above results, when such animals received a solution of sodium carbonate, equimolecular with 0.9 per cent sodium chlorid, an hour's anesthesia demonstrated the continuance of diuresis, with an increase of blood alkali above the normal.

The conclusions, drawn from his investigations, that naturally nephropathic animals may be protected in varying degrees from the toxic effects of anesthetic agents, while the failure to do so is associated with a rapid depletion of the blood alkali reserve, and the development of an acid intoxication with its concomitant fatal results, should impress us with the absolute necessity of a similar procedure in the preparation of human nephritics, upon whom a major operation is imperative.

SUSTAINING BLOOD VOLUME.

Epstein has shown that the most striking change in the blood during ether anesthesia is one of absolute diminution in its volume. This reduction, he found, is not established by a transference from the arterial to the venous system, but by a direct passage of fluid from the blood to the tissues.

The experiments of Mayer, on this subject, have led him to conclude that this is the important pathological feature, responsible for the appearance of shock during operative procedure.

Saturation of the tissues with water, transfusion of blood in those depleted or exsanguinated by hemorrhage, hypodermoclysis during operation; subsequent transfusion if necessary, an abundance of water by mouth, with further hypodermoclysis in those who vomit freely, should be given the most careful consideration.

In this connection a word with reference to the care and sterilization of hypodermic needles might be of more than passing interest. The methods in vogue, in the average hospital of today, for sterilizing and protecting their hypodermic needles leaves much to be desired.

How many times have both surgeon and anesthetist been delayed and hampered in their work by being given a dull, rusty needle, with only a partial lumen, or one completely occluded with debris and rust? This dangerous annoyance can be most easily obviated, if the following technic, adaptable in any hospital, is employed:

The needle is first sharpened, the shank cleaned by rotating within a cotton covered wooden applicator, liberally sprinkled with emery dust, followed by a thorough scouring of the barrel with the obturator similarly moistened.

After cleansing with water, the lumen can be seen to be perfectly clean and free from rust. The needle

is next air dried, the obturator reintroduced and three or four needles placed in a clean, dry test tube and sealed with a cotton plug. The test tubes, containing needles of various sizes, are now placed in an oven and subjected to a dry heat of 140 degrees for one hour, after which they are completely sterilized, can be kept indefinitely, clean, sharp, uncorroded and ready for instant use. Needles, thus cared for, will last for months or even years, always giving complete satisfaction to both surgeon and anesthetist whenever their use is required.

A valuable adjunct to the measure above quoted, especially in those patients with low blood pressure, is the prophylactic use of pituitrin, which may be given at the beginning of the operation for its stimulating effect upon the muscle coats of the arterioles.

Salinger, in a series of cases, found that the systolic pressure was increased on an average of 10 mm. and that this pressure persisted for 18 hours or more, thereby combatting, in no small degree, the postoperative depression so often witnessed in patients depleted by hemorrhage or dehydration.

Postoperative Care.

Close observation of the methods employed by different surgeons in administering postoperative care of their surgical patients has convinced the writer that scientific improvement in the management of this critical period has not kept pace with those in other branches of medicine, and still leaves much to be desired.

Notwithstanding the fact that the postoperative patient possesses an irresistible craving for water, the result of excessive perspiration, cellular activity and previous dehydration, it is the exception and not the rule to find a surgeon who will give his patient water as soon as consciousness is restored.

The degree of discomfort suffered by the patient, so needlessly deprived of water, must be experienced to be adequately appreciated.

The contention of many surgeons that vomiting and intestinal distention are provoked by the early administration of water is not borne out by the facts. All patients, except those in whom the stomach directly has been operated upon, should be given water, either hot or cold, in quantities sufficient to meet the individual's demand.

Vomiting is no contraindication to the administration of water, for in many instances it assists the patient in eliminating ether laden mucus or morphin both of which tend to produce or exaggerate the symptom of nausea as frequently seen. Where the indications are present, water by mouth is supplemented by the use of normal saline by Murphy drip or by hypodermoclysis.

The intravenous method used by some is not approved of, partly because its effects are too transient. The kidneys rapidly eliminating water thus introduced into the system, and partly because of the danger of overwhelming an already weakened or embarrassed heart.

The advisibility or necessity of administering a 5 or 10 per cent solution of glucose and sodium bicarbonate per rectum in the average case is still an open question.

It cannot be gainsaid that such a procedure is not of the highest efficacy in the patient whose vital forces are below par, or whose operation has been unnecessarily prolonged, for unless the pronounced acidosis is promptly relieved the convalescence of the patient will not only be of the stormiest nature, but also, in some instances, what has promised to be a brilliant success has been changed to dismal failure by the untimely death of the patient, a victim either of ignorance or neglect of duty.

With reference to the administration of food, a careful survey of the methods employed, shows that the majority of surgeons still adhere most tenaciously to the old teachings, that nothing but water or possibly weak tea should be given for 48 to 72 hours after operation, after which broths, fruit juices or albumen water are cautiously added, solid food not being given before the fifth to the eighth day.

Fear of prolonging nausea and vomiting together with abdominal distention seems to be the reason advanced for the withholding of solid food, but the real cause for this complication can more often be found in the irritation of the bowels by cathartics, rough handling of the tissues, flushings and the postoperative fermentation of food, in an unstimulated intestine.

When solid food such as toast, soft boiled eggs, and custard, are given within 24 to 48 hours, they furnish the normal stimulus to peristaltic activity and the patients receiving such foods undergo an unusually rapid convalescence, practically devoid of untoward complications.

The writer has been deeply impressed with the many advantages accruing from the pre- and postoperative care of patients as already outlined in detail, and he presents them for your esteemed and respectful consideration.

Brockman Bldg.

American Journal of Surgery

QUARTERLY SUPPLEMENT *of* ANESTHESIA *and* ANALGESIA

Surgery Publishing Co.

Established by J. MacDONALD, Jr., M.D.

15 EAST 26TH STREET - NEW YORK, U. S. A.

Original Articles, Clinical Reports and Experimental Researches on the Theory and Practice of Anesthesia and Analgesia, as well as pertinent Society Transactions, are solicited for exclusive publication in this Supplement. Typewritten Manuscripts facilitate Editorial Revision and avoid errors.

Subscribers Changing Address should immediately notify the publishers of their past and present locations.

Half-tones, Line-etchings and other Illustrations will be furnished by the Publishers when Photographs or Drawings are supplied by the Author.

F. HOEFFER McMECHAN, A.M., M.D., *Editor*
Avon Lake, Ohio, U.S.A.

OCTOBER EDITORIALS 1923

STANDARDIZATION OF HOSPITAL ANESTHESIA SERVICE.

Following a round table discussion of anesthesia service in the hospital, during the Syracuse meeting of the New York Division of the College of Surgeons, at which Dr. M. T. MacEachern stressed the value and importance of the medical anesthetist by means of charts taken from the operating room records, showing how such anesthetists had been responsible for life-saving service to the patient, it was suggested by Dr. Charles J. Wells, that the matter of standardizing hospital anesthesia service be brought to the attention of the Associated Anesthetists for action.

This matter was broached during both the meetings of the Canadian Anesthetists at Montreal, and the meeting of the American, Pacific Coast and California State Anesthetists, at San Francisco. At Montreal it was the consensus of the Society, after a rather full discussion, to cooperate with those in authority by establishing standardized anesthesia service through *qualified medical anesthetists.*

At the San Francisco meeting the following resolutions were passed by the several organizations in joint meeting:

WHEREAS, The safety of human life, the progress of surgery and the development of hospital service, demand the rapid extension of the specialty of anesthesia, therefore, be it

RESOLVED, That the American and Pacific Coast Associations of Anesthetists hereby commit themselves to the development and standardization of such anesthesia service in the hospitals of the United States and Canada through a standardization committee organized for this purpose, and be it further

RESOLVED, That no hospital shall be deemed to have acceptable standards (1) which does not limit the administration of all anesthetic to legally qualified medical and dental practitioners; (2) which charges or collects a fee for an anesthetic, including workmen's compensation and insurance cases, unless such anesthetic has been administered by a legally qualified physician or dentist; and be it further

RESOLVED, That the American and Pacific Coast Associations of Anesthetists condemn, as destructive of all safety to human life and the progress of anesthesia, the training or use of nurses or other lay persons as anesthetists.

The whole situation as it affects the Associated Anesthetists, would seem to resolve itself into an educational and standardization campaign, along the following lines:—

First.—That a commission, representing all branches of the Associated Anesthetists, collaborate in compiling and publishing an exhaustive, illustrated pamphlet covering the scope of utility of the medical and dental anesthetist in relation to the specialty of anesthesia and anesthesia service.

Second.—That a copy be sent to all those concerned in better anesthesia and especially to those in charge of hospital management in the United States and Canada. It is suggested that the expense of this be prorated among the regional societies according to the strength of their memberships.

Third.—That this pamphlet clearly state the responsibilities of the medical and dental anesthetist on the operating team and the vital connection of such expert anesthesia service to the patient. That a short review of the accomplishments of the Associated Anesthetists be included to add weight and influence to a clear, dispassionate and exhaustive consideration of the specialty and hospital service.

Fourth.—That approved plans for the ideal organization, equipment and operation of anesthesia departments and service be drawn up to fit all types of hospitals.

Fifth.—That a permanent clearing house be established, where properly qualified medical and dental anesthetists, wishing positions, may be listed and to which enquiring parties may be referred.

The time is now ripe to crystalize general ideas and ideals of anesthesia service into something definite and concise to be placed before the entire allied professions of the United States and Canada. There is no reason why the Associated Anesthetists should hesitate to standardize and rate the various hospitals according to the proper personnel, organization and work of their anesthesia departments. This will also make it easy for the various hospital managements and staffs to do the right thing and follow approved plans in organizing their anesthesia services. This matter has now been favorably broached and will come up for further consideration during the Congress of Anesthetists in Chicago and the meeting of Southern Anesthetists in Washington.—McM.

Book Reviews

Anesthesia in Children. By C. Langton Hewer, M.B., B.S., Lond., M.R.C.S., Eng., L.R.C.P.; Lond. H. K. Lewis & Co., Ltd., London, Publishers, 1923.

The subject of anesthesia in children is one to which much importance is not usually attached.

The average student or interne, who qualifies at a general hospital, has usually had very little experience in anesthetizing children, and leaves under the vague impression that they only want a few whiffs of an anesthetic and they will be all right. He is soon disillusioned and realizes that the child presents a difficult problem, requiring quite as much, if not more skill to anesthetize than does the adult. By this time, however, his opportunity of learning from others has passed, and he has had to acquire his knowledge from bitter experience.

Hewer, therefore, hopes that his little work may be of some use in showing a few general principles to be followed. Most of the elementary teaching has been purposely omitted as it has been assumed that the reader is already familiar with the rudiments of anesthesia, but an attempt has been made to point out the differences of behaviour between children and adults.

As far as possible, simple methods have been described, in order to render the book more useful to the general practitioner, who is not always so situated as to be able to employ complicated apparatus.

Hewer discusses in detail the preparation and after-treatment of the patient; general principles; short anesthesias in children; ethanesal, chloroform ether and mixtures; and special methods of general anesthesia as applicable in certain common operations in children.

The chapter on ethanesal is one of the most complete and noteworthy expositions of a newer anesthetic that has been contributed to the current literature of anesthesia and is well worth study on account of the painstaking laboratory researches of R. L. Mackenzie Wallis, as well as the clinical experiences of the author.

Chloroform Anesthesia. By A. Goodman Levy, M.D., M.R.C.P. William Wood & Co., Publishers, New York, 1922.

Anesthesia, in its various aspects, has been the subject of many writers, but, heretofore, has not been brought into close enough touch with the experimental sciences. In order to make this contact, a combination of practical and laboratory experience was required, and this has only occasionally been available.

Not many years ago it would have been considered an anomaly, almost an intrusion, for the experimental research worker to discuss so practical a procedure as anesthesia. Experience in the operating room alone was then admissable as a credential; and as far as the details of technical anesthesia are concerned, this is still true.

In the present volume, Levy is interested not only in the details of the methods of anesthesia, but also in the principles on which they are based, and here the experimental research worker finds his own domain.

Levy has shown how much the practice of anesthesia in man is dependent on the principles of the basic sciences; how the same laws of physics hold in the ward and in the laboratory, and how necessary it is that the anesthetist should recognize their bearings on his problems. His previous work on chloroform syncope showed how advances in anesthesia may be made by experiments on animals. Without these it would have been impossible to ascertain the most frequent cause of death under chloroform—ventricular fibrillation—and to take measures to anticipate its occurrence.

This manual places the practice of anesthesia on a new and firmer basis and will be a boon to those engaged in its practice, as Levy's viewpoint is that of the anesthetist, internist and research worker combined—a singularly rare but resultful viewpoint. All that Levy writes about chloroform has its application to all other anesthetics and every anesthetist will profit by possessing himself of the contents of this book.

But not only the anesthetist may benefit from it, for its masterly analysis of the fundamental principles of the distribution of a drug in the tissues, must interest a wider circle, for these principles obtained in large part when other drugs than chloroform are involved.

Through this volume research workers are furnished with a further point of contact with practice, and with a splendid example of the importance of the fundamental principles controlling active intervention in disease.

Anesthetics and Their Administration. By the late Sir Frederic Hewitt. *Fifth Edition*, Edited by Henry Robinson, M.A., M.D., B.Ch. The Oxford Medical Publications, London and New York, 1922.

The *Fourth Edition* of this invaluable text book was edited by Robinson under the immediate supervision of the late Sir Frederic Hewitt, its original author. The responsibility for the statements and opinion contained in that edition were Hewitt's. Since then the advance in the science of anesthesia has been more rapid than in any similar period of time, except perhaps during the early years following its discovery.

In consequence large sections of the *Fifth Edition* have been entirely rewritten and there is scarcely a page that has been allowed to stand unrevised. Hewitt's breadth of mind and keenness of progress were so conspicuous during his lifetime, that he would have been among the first to realize that much of the teaching current a decade ago has been rendered obsolete by recent developments. Robinson hopes that his opinion expressed in this edition would have commended themselves to Hewitt, if he had survived; right or wrong, however, Robinson assumes the entire responsibility for the revised clinical teaching in this edition.

Perhaps the finest feature of this *Fifth Edition* is the revision of the chapters dealing with the Physiology of Anesthesia by Prof. A. J. Clark of the University College, London. This masterly synopsis of this difficult subject should not only be used by all anesthetists for their own benefit, but should also serve as the basis of their teaching of anesthesia to students.

This *Fifth Edition* is replete with the exhaustive details of the practices of a master anesthetist, and those who make this book their own will largely profit in improving their technic. All anesthetics and methods are discussed and some of the most resourceful chapters are those devoted to the difficulties of anesthesia and the after-care of patients.

As in the *Fourth Edition* the chapter on the Medico-Legal Aspects of Surgical Anesthesia, is supplied by Mr. Digby Cotes-Preedy.

The Assessment of Physical Fitness by Correllation of Vital Capacity and Certain Measurements of the Body. By GEORGES DREYER, C.B.E., M.A., M.D., and GEORGE FULFORD HANSON. PAUL B. HOEBER, Publisher, New York, 1921.

The importance of the physical fitness of man has been only partially appreciated in the estimate of prognosis by physicians in the examination of the sick and the measurement of the lung capacity by examiners for insurance companies. Dreyer has shown that the estimation of vital capacity is more than a mere test, that it indicates the tendency to health and the resistance to disease, and that in a prognosis of life's duration it parallels very closely the results of a general examination.

Inasmuch as food by its oxidation in muscles or special glands maintains life and function, the perfect body is the one, which by its efficient lung surface and heart capacity for circulation, gives opportunity for oxidation of an adequate intake of food.

It is Dreyer's aim to supply medical men with a method, new only in the details of its application, whereby, physical fitness can be assessed on the basis of a few simple physical measurements. Dreyer has been able to show definite relationships between the weight of the body, the length of the trunk and the circumference of the chest, as well as to demonstrate the uniformity of their relationships to the vital capacity of the lungs.

Although these relationships are comparatively simple the process of calculating each of them necessitates the expenditure of so much time and attention that much of their value for immediate, practical application would be lost if separate calculations for each case had to be made. To avoid this Dreyer and Hanson have constructed exhaustive series of tables enabling all persons interested or concerned to quickly and easily gain correct information, which otherwise only could be obtained through a series of laborious calculations.

In the physiological era of surgery, vital capacity is of paramount interest to the anesthetist in pre-operative evaluation of all patients and in assessing them as normal or abnormal; and Dreyer has provided the basic considerations and the test for doing this.

Proceedings of the Royal Society of Medicine: Section of Anesthetics. Volumes 14 and 15, 1920-1922. LONGMANS, GREEN & Co., Publishers, London, 1921, 1922.

Volume Fourteen contains the following interesting and instructive papers presented before the Section of Anesthetics during the sessions of 1920-1921:

The Psychology of Anesthesia. Dudley Wilmot Buxton.

Anesthetics in Plastic Surgery of the Face and Jaws. E. S. Rowbotham and Ivan Magill.

The Importance of an Examination of Patients by the Anesthetist Previous to Anesthesia. Raymond D. Apperly.

Explosion of Ether Vapor During Laryngoscopy. W. J. McCardie.

A New General Anesthetic—Ethanesal: Its Theory and Practice. R. L. MacKenzie Wallis and C. Langton Hewer.

Volume Fifteen contains equally as profitable papers presented before the Section of Anesthetics during the session of 1921-1922.

Report on a Visit, as Official Representative of the Section of Anesthetics, to the First Meeting of the Canadian Society of Anesthetists at Niagara, and to the Meeting of the American Association of Anesthetists at Boston, in June, 1921. H. Edmund G. Boyle.

Discussion on the Utility and Limitations of Nitrous Oxid Anesthesia. A. L. Flemming, G. A. H. Barton, H. E. G. Boyle, Mr. Chaldecott, H. M. Page, and F. E. Shipway.

Anesthesia in Intracranial Surgery. Z. Mennell.

All these papers are well worth a reading and some of them are of exceptional merit from both the technical and research viewpoints. Again these volumes are a current evidence of how the specialty of anesthesia is maintaining its splendid progress.

Practical Local Anesthesia and Its Surgical Technic. ROBERT EMMET FARR, M.D., F.A.C.S., Minneapolis, Minn. Illustrated with 219 engravings and 16 plates. LEA & FEBIGER, Publisher, Philadelphia and New York, 1923.

This volume of Farr's has been looked forward to for a long time with pleasurable anticipation on the part of all those whose opportunity it has been to see this master craftsman at this special work. This book is an expression of the author's views on the subject of local anesthesia as developed by his own observation and experience. It is a supremely personal book. Those who have awaited it will not be disappointed in its contents. It overtops all expectations.

Its aim is to present to the medical profession the advantages of local anesthesia to patient and to surgeon, and to describe the practical details of methods of administration and of operative technic employed in its use. As far as possible, stress has been laid upon the particular methods which have proven best in the author's experience. Every effort has been made to portray in a vivid manner the simplest and most efficient means of using local anesthesia. Even at the risk of seeming to be tedious, by introducing what might be considered an unnecessary amount of detail, Farr has endeavored to present the methods which have carried him through the critical stages of the various operations.

Illustrations in the form of drawings and photographic reproductions have been freely used wherever they were considered of advantage in helping to clarify the text. To further illustrate the feasibility of performing the various types of operation under local anesthesia, case reports have been inserted.

For the sake of convenience Farr has divided his book into three parts:

In Part I, consisting of Chapters I to VI., inclusive, certain problems are considered in connection with anesthesia, including equipment, technic and the description of the sensory nervous system.

In Part II, which comprises Chapters VII to XII, inclusive, the subject has been considered regionally, all portions of the body, aside from the abdomen, being treated.

In Part III, which includes the final six Chapters, the surgery of the abdomen is considered.

It is Farr's belief that the actual method of operating has a most important bearing upon the success which will attend any surgical procedure under local anesthesia. Hence points in surgical technic have been described with more than ordinary detail. It this way sufficient descriptive material regarding both the technic of administering local anesthesia and the technic of operating have been introduced to point the way with clarity and encourage the surgeon to adopt a certain degree of uniformity in his methods.

The necessity for team-work among assistants in the treatment of patients and the importance of the phsychic factor have been especially stressed.

Induction of local anesthesia in any given area involves anatomical, surgical and phsychic factors which in the past were ignored, overlooked or unthought of by the novice, and which account for the frequent early failures of the method. However, the problem has been studied from every conceivable angle, and every beneficial influence has been utilized by Farr, so that his success has been phenomenal and most gratifying; and may be duplicated by anyone willing to profit by his example and experiences.

His many personally devised improvements in instruments, technic and accessory aids should not be lightly passed over as they account for much of his success. Hertzler has remarked that, "Master local anesthetists will always be as scarce as first violinists in symphony orchestras." On this basis Farr is not only a supreme *concert meister*, but he has, in a sense, orchestrated the entire operating room technic and equipment for the ultimate demonstration of the possibilities of local anesthesia.

Practical Anesthesia for the Student and General Practitioner. By CHARLES F. HADFIELD, M.B.E., M.A., M.D., Camb. Publishers, WILLIAM WOOD & Co., New York, 1923.

Of recent years, the administration of anesthetics has been improved by the introduction of so many new

methods, often involving the use of complicated and costly apparatus, that it is impossible in an elementary handbook to describe or even mention them all.

Hadfield's object is to give to the medical and dental student and practitioner theoretical and practical information sufficient to enable him to give anesthetics for all usual operations. His book is only intended to be additional to practical instruction, for there is, perhaps, no branch of medical science that depends more on practical and less on theoretical instruction than anesthetics.

However, the conditions under which the practical instruction has to be carried out in an operating theatre do not always permit of prolonged verbal explanations. Thus much time can be saved and additional benefit obtained, if the student has already familiarized himself by reading about the main principles involved. Thus the chief aim of Hadfield's handbook has been to make the directions as practical as possible, and every care has been taken to include the small manipulative details which are so important in obtaining good results.

Problems of purely theoretical interest are not discussed and even the physiological actions of the various anesthetics are only lightly touched upon except in cases, such as that of choloform, where they have a very practical bearing upon the actual methods and dangers of administration. The methods selected for detailed description are those which Hadfield has found most satisfactory in his own hands, after considerable experience. These have been chosen as being suitable, easily learned and involving fairly simple and inexpensive apparatus. It is much more important for an anesthetist to be thorough master of a few good methods than to be acquainted with the details of a much larger number, none of which he so completely understands.

Owing to modern requirements necessitating the training of dental students in anesthetics, particular attention has been devoted to the administration of nitrous oxid for dental extractions and other procedures.

Local and regional analgesia have been entirely omitted with the exception of spinal anesthesia.

In the description of each method Hadfield's purpose has been to concentrate upon the small details that are so important in order that, avoiding useless generalities, the student may find definite information of how to proceed from the very commencement until surgical anesthesia has been achieved and maintained to the close of the operation. Although intended primarily for the use of medical and dental students, it is hoped that this handbook may also be of assistance to the qualified practitioner who realizes the desirability of refreshing his knowledge.

Society Proceedings

CONGRESS OF ANESTHETISTS, CHICAGO, ILLS., OCTOBER 22-24—AUDITORIUM HOTEL.

Plans for the Second Annual Congress of Anesthetists, held under the auspices of the National Anesthesia Research Society in Joint Meeting with the Interstate, Mid-Western and Chicago Anesthetists, have developed sufficiently to warrant an announcement of the following preliminary details of the program. A number of leading research workers have been invited to present the latest investigations of their laboratories and have tentatively accepted.

Research Sessions.

Studies of Ether Anesthesia Under Varying Conditions of Temperature and Humidity.
H. E. Barbour, M.D., Louisville, and Wesley Bourne, M.D., Montreal.

A Comparison of the Effect of Repeated Administrations of Different Brands of Anesthetics on the Blood Catalase.
W. E. Burge, M.D., Urbana, Ills.

Further Pharmacological Studies in Relation to Anesthesia.
D. E. Jackson, M.D., Cincinnati.

Ether Anesthesia and Traumatic Shock.
McKeen Cattell, Ph.D., Boston.

Blood Volume and Flow in Relation to Anesthesia.
R. Gessell, M.D., St. Louis.

Studies in Narcosis: IV, Respiration and Metabolism in Ether Anesthesia.
Theo. Kruse, Ph.D., Pittsburgh, Pa.

Further Studies in Nitrous Oxid and Oxygen Percentages.
C. W. Greene, Ph.D., Columbia, Mo.

A Theory of the Action of Narcotics and Anesthetics.
Jos. S. Hughes, Ph.D., Manhattan, Kan.

Observations on Some Reflex Effects of Ether Anesthesia.
M. S. Dooley, M.D., Syracuse, N. Y.

Symposium on Newer Anesthetics.

Great interest has been developing regarding both the research and clinical phases of the newer anesthetics, and this subject will be covered by a Symposium of pertinent papers.

Research Studies in Ethylene-Oxygen Anesthesia.
A. B. Luckhardt, M.D., and J. B. Carter, Ph.D., Chicago.

Studies in Ethylene-Oxygen and Combined Anesthesia.
W. Easson Brown, M.D., Toronto.

Clinical Experiences with Ethylene-Oxygen Anesthesia.
Isabella C. Herb, M.D., Chicago.

Pure Acetylene Anesthesia.
Chas. M. Jordan, M.Sc., Manhattan, Kan.

Studies in the Newer Local Anesthetics.
A. S. Loevenhart, M.D., Madison, Wis.

Laboratory Demonstrations and Clinics.

Through the courtesy of Prof. Hugh McGuigan, the laboratories of the University of Illinois Medical School, have been opened for the Congress and the research workers in attendance have been invited to demonstrate certain experimental phases of their investigations. Clinics, under the Chairmanship of Dr. Isabella C. Herb, will be held in a group of neighborhood hospitals. Local and visiting anesthetists will give the newer anesthetics and show perfected methods of anesthesia.

Anesthesia in Oral Surgery and Dentistry.

As usual there will be a Special Session devoted to Anesthesia in Oral Surgery and Dentistry and it is anticipated that the members of the Chicago Dental Society will attend this session. The following papers will be presented:—

The Diabetic Risk in Oral Surgery.
B. H. Harms, D.D.S., Omaha.

Physical Examination and Management of Preoperative Complications of Anesthesia.
F. A. Thompson, D.D.S., Milwaukee.

Combined Nitrous Oxid-Oxygen-Anesthol Anesthesia for Oral Surgery.
Ralph H. Fouser, D.D.S., Chicago.

The Comparative Potency and Toxicity of Local Anesthetics With Some Experimental Data Regarding Antidotes.
H. A. Higgins, Ph.D., Chicago.

Symposiums on Handling Handicapped Patients.

Surgeons are realizing more and more that professional anesthesia means the recovery of a large number of their bad risk patients, hence, the cooperation of a number of noted surgeons in presenting pertinent papers on handling handicapped patients:—

Preparation of Bad Surgical Risk Patients.
Charles T. Souther, M.D., Cincinnati.

Responsibility of Surgeon and Anesthetist in Two Stage Goiter Operations.
Frank H. Lahey, M.D., Boston.

Further Studies in Obstructive Jaundice in Relation to Surgery and Anesthesia.
Waltman Walters, M.D., Rochester, Minn.

Anesthesia for the Tuberculous Patient.
Lloyd R. Allen, M.D., Colorado Springs.

Myocardial Deficiency from a Surgical Standpoint.
J. L. Yates, M.D., Milwaukee.

Symposium on Nitrous Oxid-Oxygen Anesthesia.

On account of the growing importance of nitrous oxid-oxygen anesthesia and its extended application to all phases of surgery, a Symposium on this subject has also been arranged for, with the following papers and speakers:—

The Newer Concepts and Clinical Possibilities of Nitrous Oxid-Oxygen Anesthesia.
E. I. McKesson, M.D., Toledo.
Nitrous Oxid-Oxygen Anesthesia from the Surgeon's Viewpoint.
Weller Van Hook, M.D., Chicago.
Nitrous Oxid-Oxygen-Ether Sequence in Open Mouth Surgery: Including a Preliminary Report on the Use of Ethylene.
Will Walter, M.D., Evanston, Ills.
The Clinical Scope and Utility of Carbon Dioxid Filtration in Nitrous Oxid-Oxygen Anesthesia.
Ralph M. Waters, M.D., Sioux City, Iowa.
Further Studies in Continuous Nitrous Oxid-Oxygen Analgesia in Obstetrics.
A. E. Rives, M.D., and Edw. H. Lane, M.D., East St. Louis, Ills.
Nitrous Oxid-Oxygen Anesthesia in Difficult Cases.
Everett A. Tyler, M.D., Philadelphia.
Nitrous Oxid-Oxygen in Genito-Urinary Surgery.
John J. Buettner, M.D., Syracuse, N. Y.

FOREIGN VISITORS.

Invitations have been extended some interest Foreign Visitors and if present prospects mature several of these will be in attendance. The Section on Anesthetics of the Royal Society of Medicine is sending an Official Representative to the Congress and the French and Swedish Governments may do the same. In that event the following addresses will be presented:—
Anesthesia for Intracranial Surgery.
Z. Mennell, M.B., M.R.C.S., L.R.C.P., London, England.
Ether Content of the Blood.
Karl Gramen, M.D., Stockholm, Sweden.
Oscillometric Blood Pressure Studies in Relation to Surgery and Anesthesia.
G. Jeanneney, M.D., Bordeaux, France.

FURTHER ARRANGEMENTS AND ENTERTAINMENT.

The Scientific Sessions of the Congress, as well as the Commercial Exhibits, will be held on the ninth floor of the Auditorium Hotel in a spacious banquet hall and adjoining rooms well adapted for the purpose. The time and place of the Congress will enable anesthetists to be away when their surgeons are attending the Clinical Congress of Surgeons. It will also enable these surgeons to come across the street to the Congress of Anesthetists and learn how the specialists in anesthesia are striving to meet all the demands of the Physiological Era of Surgery.

Dr. Frank J. Bernard will head the Committee having the local social events in charge. Visits to the Art and Field Museums, theater parties, auto tours of the parks and luncheons are in contemplation. The Annual Dinner will be served at the Auditorium Hotel on Tuesday evening, October 23. Be sure and bring your ladies to lend grace and charm to the occasion, which will be enlivened with good music, clever speakers and dancing.

MEMBERSHIP.

Membership in the several Associations is open to all licensed and qualified members of the medical and dental professions, as well as to research workers holding doctorates of similar standing, who are interested in advancing the specialty of anesthesia. You are urged to bring in all the new members you can. If you are not already a member write for Membership Applications and return with your separate checks or money orders for the Societies you wish to join, or the Journals you wish to subscribe to. The prompt payment of dues will be considered a friendly courtesy. Make your reservation at the Auditorium Hotel at once to avoid disappointment.

The Officers and Committees of the several Associations will do everything they can to make the Congress a memorable one, and you may rest assured that attendance will amply repay you in every way.

For further information, address:

F. H. McMechan, M.D., Secretary General,
Lake Shore Road, Avon Lake, Ohio.

SOUTHERN ASSOCIATION OF ANESTHETISTS, SECOND ANNUAL MEETING, WASHINGTON, D. C., NOVEMBER 12-14, BURLINGTON HOTEL.

The Southern Association of Anesthetists will hold its Second Annual Meeting in conjunction with the Southern Medical Association, in Washington, D. C., November 12-14, at the Burlington Hotel.

During the scientific sessions some of the papers and speakers will be as follows:
President's Address.
Ansel M. Caine, M.D., New Orleans.
Ethlene-Oxygen Anesthesia.
S. Griffith Davis, M.D., Baltimore.
The Value of Nitrous Oxid-Oxygen in Oral Surgical Operations.
Sterling V. Meade, D.D.S., Washington, D. C.
The Importance of Teaching Signs and Phenomena of the Stages of Surgical Anesthesia.
J. G. Poe, M.D., Dallas, Texas.
Oxygen Supply and Demand in General Anesthesia.
R. C. Whitehead, M.D., Norfolk, Va.
Further Studies of the Blood Before and After Anesthesia.
Mary Gage Day, M.D., Kingston, N. Y.
Minor Pulmonary Embolism as a Postoperative Complication in Gynecology.
L. R. Wharton, M.D., and J. W. Pierson, M.D., Baltimore.
Further Studies in Iso-agglutinins Before and After Ether Anesthesia.
M. Huck, M.D., Baltimore.
General and Local Anesthesia in Face and Jaw Surgery.
L. Miller, D.D.S.
Subject to be announced.
H. W. Kearney, M.D., Washington, D. C.
Laboratory Experiments With Ethylene Dichloride.
Cline N. Chipman, M.D., and A. W. Hunter, M.D., Washington, D. C.

Anesthesia clinics will be held during the meeting in a group of Washington hospitals under the direction of the local anesthetists, and visiting anesthetists will be invited to demonstrate routine and newer methods of anesthesia. It is also expected that a number of pertinent laboratory demonstrations will be shown in the laboratories of Georgetown University.

The Southern Association of Anesthetists is anxious to have all members of the medical and dental professions in the South, interested in anesthesia, on its roster, and you are cordially invited to attend this Second Annual Meeting and also to bring it to the attention of all others who may be interested in attending.

For further information, address
Wm. Hamilton Long, M.D., Sec'y-Treas.,
1911 Duker Ave., Louisville, Ky.

Quarterly Index

ACIDOSIS, ACID-ALKALI EQUILIBRIUM AND. Desgrez and Bierry. Paris Medical, March 31, 1923.

ACIDOSIS OF FASTING AND DIABETIC ACIDOSIS, ESSENTIAL DIFFERENCE BETWEEN. Labbe. Bulletin de l'Academie de Medicine, February 20, 1923.

ACIDOSIS, THE MODERN CONCEPTION OF. J. S. Weingart, Des Moines. Iowa. Illinois Medical Journal. June. 1923.

ANALGESIA, SYNERGISTIC. Frank D. Smythe, Memphis, Tenn. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ANESTHESIA, GENERAL, LECITHIN IN RELATION TO. K. Tittle. Deutsche medizinische Wochenschrift, May 4, 1923.

ANESTHESIA, GENERAL, METHODS OF TEACHING TO DENTAL STUDENTS. E. W. Martindale, Columbus, O. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ANESTHESIA, POST-GRADUATE TEACHIN, FOR DENTAL STUDENTS. H. I. Dorr and TheodD. Casto, Philadelphia. American Journal of SurgAnesthesia Supplement, July, 1923.

ANESTHESIA, GENERAL, IN RELATION ENTAL SURGERY. B. Weinbren. Medical Journal of th Africa, May, 1923.

ANESTHESIA. GENERAL PRINCIPLES OF. ssler. Deutsche medizinische Wochenschrift, Marc 1923.

ANESTHESIA WITH DICHLORMETHANE GYNECOLOGY AND OBSTETRICS. T. Schumacher. ische Wochenschrift, March 19, 1923.

ANESTHESIA AND ANESTHETICS. C. Hstin, Vancouver. Canadian Medical Association JourMay, 1923.

ANESTHETIC AND SURGICAL PROBLEMS ALVEOLECTOMY. F. F. Molt, Chicago. Current Reies in Anesthesia and Analgesia, June, 1923.

ANESTHETICS, LARYNGEAL INTUBATION S. Rowbotham. British Medical Journal, June 30, .

ANESTHETICS, NEW. C. Langton HevLondon. British Journal of Anesthesia, July, 1923.

ANESTHETICS, USE OF. E. BaumanZentralblatt für Chirurgie, May 19, 1923.

ANESTHETIST'S POINT OF VIEW. Wmbster, Winnipeg. American Journal of Surgery, Aesia Supplement, July, 1923.

ANESTHETISTS, THE PROFESSIONAL, PM OF SERVICE IN THE RELATIONS OF, TO THE SURGEO Ansel M. Caine, New Orleans. American Journa Surgery, Anesthesia Supplement, July, 1923.

ANESTHETIST, THE PHYSICIAN AS. M. Curran, Chatsworth, N. J. American Physiciame, 1923.

BLOOD CHANGES, SOME CHEMICAL, IRONIC ALCOHOLISM. F. R. Nuzum, Santa Bar Calif. Journal American Medical Association, A 11, 1923.

BLOOD PRESSURE DURING OPERATIONS. Koenig. Deutsche Zeitschrift für Chirurgie, March 923.

BLOOD PRESSURE—AUTOMATIC AND RE FACTORS IN THE MAINTENANCE OF BLOOD PRESSUditorial. Journal American Medical Association, J 3, 1923.

BLOOD PRESSURE OBSERVATIONS, SOMEINAL. Virgil C. Kinney, Wellsville, N. Y. Journmerican Medical Association, June 16, 1923.

BLOOD PRESSURE IN ACUTE NEPHRIEFFECT OF MAGNESIUM SULPHATE ON. KennethBlackfan, Cincinnati. Journal American Medicalociation, July 28, 1923.

BLOOD, THE REACTION OF IN REFERETO THE REGULATION OF RESPIRATION AND THE UENCE OF ANESTHESIA THEREON. A. W. Downlmonton, Canada. Curre.t Researches in Anesthesia Analgesia, June, 1923.

BLOOD GASES AND RESPIRATION IN DE, EXAMINATION OF WITH REFERENCE TO CAUSE BREATHLESSNESS AND CYANOSIS. J. M. Campbell, . Hunt and E. P. Poulton. Journal of Pathology acteriology, Edinburg, April, 1923.

DEATH, CAUSE OF IN ELECTRIC SHOCrchives of Radiology, London, March, 1923.

DEATH FOLLOWING OPERATION FOR VAL OF TONSILS. F. W. Bailey, Cedar Rapids, . Laryngoscope, May, 1923.

DEATH, UNEXPECTED, ESPECIALLY CHILDREN, WITH COMMENTS ON STATUS LYMPHS. E. Glynn and R. C. Dun. Lancet, June 30, 19

ETHER ANESTHESIA, LIGHT. A. lemming, Bristol Medico-Chirurgical Journal, Mar 23.

ETHER, COTTON PROCESS, SCOPE ANILITY OF. C. C. McLean, Dayton, O. Current Reies in Anesthesia and Analgesia, June, 1923.

ETHER, OPEN, FOR THE OCCASIONANESTHETIST. A. Waters. Lancet, April 28, 1923.

ETHER ANESTHESIA, PROPER DEPTH OF. F. R. Widdowson, Philadelphia. Atlantic Medical Journal, April, 1923.

ETHER ANESTHESIA, THE VALUE OF PRESSURE AND CONTROLLED REBREATHING IN. J. J. Vega, Dayton, O. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ETHER, ANESTHETIC, THE STANDARDIZATION OF, TOGETHER WITH THE ANALYSIS FOR AND INFLUENCE OF IMPURITIES. Allan Winter Rowe, Boston. Current Researches in Anesthesia and Analgesia, June, 1923.

ETHER THERAPY IN ACUTE PURULENT PERITONITIS. V. Caccini. Policlinico, April 30, and May 7, 1923.

ETHER THERAPY IN PNEUMONIA AND BRONCHITIS IN CHILDREN. F. L. Presti-Seminerio. Pediatria, February 15, 1923.

ETHER THERAPY IN WHOOPING COUGH. J. Bedo. Zeitschrift für Kinderheilkunde, June 7, 1923.

ETHER-OXYGEN EXPLOSIONS: THREE CASE REPORTS. Arthur E. Guedel, Indianapolis, Ind. Current Researches in Anesthesia and Analgesia, August, 1923.

ETHYL ANESTHETIC, A NEW. A. Lecerf. Presse Medicale, May 30, 1923.

ETHYL CHLORID-ALCOHOL GENERAL ANESTHESIA. Rene Reding, Brussels. Archives de Chirurgie Franco-Belges, March, 1923.

ETHYL CHLORID IN THE TREATMENT OF MYIASIS. Antonio Pedro. Brazil-Medico, Rio de Janerio, April 7, 1923.

ETHYL CHLORID AS AN ANESTHETIC FOR MINOR OPERATIONS IN CHILDREN. S. F. Rose. Lancet, June 16, 1923.

ETHYLENE AS A GENERAL ANESTHETIC, PRELIMINARY REPORT ON EXPERIMENTS WITH. W. Easson Brown, Toronto. Current Researches in Anesthesia and Analgesia, June, 1923.

ETHYLENE, WHAT IS NOW KNOWN CONCERNING. A. E. Guedel. Indianapolis Medical Journal, July, 1923.

ETHYLENE AND ACETYLENE AS ANESTHETICS. Chas. N. Jordan, Manhattan, Kansas. Journal American Medical Association, June 9, 1923.

HISTORICAL—EARLY ANESTHESIA. Sir D'Arcy Power, London. British Journal of Anesthesia, July, 1923.

LOCAL ANESTHESIA. O. D. King. U. S. Naval Medical Bulletin, June, 1923.

LOCAL ANESTHESIA, BLOOD PRESSURE DURING. Wiemann. Deutsche Zeitschrift für Chirurgie, March 30, 1923.

LOCAL ANESTHESIA—NOVOCAIN DERMATITIS. J. V. Klander, Philadelphia. La Odontologia, May, 1923.

LOCAL ANESTHESIA—RELATIVE TOXICITY OF SOME RECENT LOCAL ANESTHETICS. H. E. Tompkins, New York City. Dental Items of Interest, July, 1923.

LOCAL ANESTHESIA—COCAIN POISONING, A STUDY OF THE ACTION OF CALCIUM IN EXPERIMENTAL. Ira Frank, J. F. Strauss and W. A. Smiley, Chicago. Journal American Medical Association, June 30, 1923.

LOCAL ANESTHESIA, SURGICAL STRATEGY AS AN ADJUNCT TO, IN ABDOMINAL SURGERY. R. E. Farr, Minneapolis, American Journal of Obstetrics and Gynecology, July, 1923.

LOCAL ANESTHESIA, SOME OF THE FACTORS UPON WHICH THE SUCCESSFUL USE DEPENDS. R. E. Farr, Minneapolis. Illinois Medical Journal, July, 1923.

LOCAL ANESTHESIA—BLOCKING NERVE TO UPPER JAW. J. U. Carrea. Semana Medica, April 19, 1923.

LOCAL ANESTHESIA—NERVE BLOCKING FOR LOCKJAW. Vincent and Bernard. Bulletins de la Societee Medicale des Hopitaux, February, 16, 1923.

LOCAL ANESTHESIA—INTRAMUSCULAR INJECTION OF ALCOHOL FOR RECURRENT LUXATION OF THE JAW. Sicard. Bulletin de l'Academie de Medicine, February 20, 1923.

LOCAL ANESTHESIA—BLOCKING THE PHRENIC NERVE IN INJURY OF THE DIAPHRAGM. Baron. Zentralblatt für Chirurgie, March 17, 1923.

LOCAL ANESTHESIA FOR HERNIA. B. F. Stevens, El Paso. Southwestern Medicine, June, 1923.

The Newer Concepts and Clinical Possibilities of Nitrous Oxid-Oxygen Anesthesia.
E. I. McKesson, M.D., Toledo.
Nitrous Oxid-Oxygen Anesthesia from the Surgeon's Viewpoint.
Weller Van Hook, M.D., Chicago.
Nitrous Oxid-Oxygen-Ether Sequence in Open Mouth Surgery: Including a Preliminary Report on the Use of Ethylene.
Will Walter, M.D., Evanston, Ills.
The Clinical Scope and Utility of Carbon Dioxid Filtration in Nitrous Oxid-Oxygen Anesthesia.
Ralph M. Waters, M.D., Sioux City, Iowa.
Further Studies in Continuous Nitrous Oxid-Oxygen Analgesia in Obstetrics.
A. E. Rives, M.D., and Edw. H. Lane, M.D., East St. Louis, Ills.
Nitrous Oxid-Oxygen Anesthesia in Difficult Cases.
Everett A. Tyler, M.D., Philadelphia.
Nitrous Oxid-Oxygen in Genito-Urinary Surgery.
John J. Buettner, M.D., Syracuse, N. Y.

FOREIGN VISITORS.

Invitations have been extended some interest Foreign Visitors and if present prospects mature several of these will be in attendance. The Section on Anesthetics of the Royal Society of Medicine is sending an Official Representative to the Congress and the French and Swedish Governments may do the same. In that event the following addresses will be presented:—
Anesthesia for Intracranial Surgery.
Z. Mennell, M.B., M.R.C.S., L.R.C.P., London, England.
Ether Content of the Blood.
Karl Gramen, M.D., Stockholm, Sweden.
Oscillometric Blood Pressure Studies in Relation to Surgery and Anesthesia.
G. Jeanneney, M.D., Bordeaux, France.

FURTHER ARRANGEMENTS AND ENTERTAINMENT.

The Scientific Sessions of the Congress, as well as the Commercial Exhibits, will be held on the ninth floor of the Auditorium Hotel in a spacious banquet hall and adjoining rooms well adapted for the purpose. The time and place of the Congress will enable anesthetists to be away when their surgeons are attending the Clinical Congress of Surgeons. It will also enable these surgeons to come across the street to the Congress of Anesthetists and learn how the specialists in anesthesia are striving to meet all the demands of the Physiological Era of Surgery.

Dr. Frank J. Bernard will head the Committee having the local social events in charge. Visits to the Art and Field Museums, theater parties, auto tours of the parks and luncheons are in contemplation. The Annual Dinner will be served at the Auditorium Hotel on Tuesday evening, October 23. Be sure and bring your ladies to lend grace and charm to the occasion, which will be enlivened with good music, clever speakers and dancing.

MEMBERSHIP.

Membership in the several Associations is open to all licensed and qualified members of the medical and dental professions, as well as to research workers holding doctorates of similar standing, who are interested in advancing the specialty of anesthesia. You are urged to bring in all the new members you can. If you are not already a member write for Membership Applications and return with your separate checks or money orders for the Societies you wish to join, or the Journals you wish to subscribe to. The prompt payment of dues will be considered a friendly courtesy. Make your reservation at the Auditorium Hotel at once to avoid disappointment.

The Officers and Committees of the several Associations will do everything they can to make the Congress a memorable one, and you may rest assured that attendance will amply repay you in every way.

For further information, address:

F. H. McMechan, M.D., Secretary General,
Lake Shore Road, Avon Lake, Ohio.

SOUTHERN ASSOCIATION OF ANESTHETISTS, SECOND ANNUAL MEETING, WASHINGTON, D. C., NOVEMBER 12-14, BURLINGTON HOTEL.

The Southern Association of Anesthetists will hold its Second Annual Meeting in conjunction with the Southern Medical Association, in Washington, D. C., November 12-14, at the Burlington Hotel.

During the scientific sessions some of the papers and speakers will be as follows:
President's Address.
Ansel M. Caine, M.D., New Orleans.
Ethlene-Oxygen Anesthesia.
S. Griffith Davis, M.D., Baltimore.
The Value of Nitrous Oxid-Oxygen in Oral Surgical Operations.
Sterling V. Meade, D.D.S., Washington, D. C.
The Importance of Teaching Signs and Phenomena of the Stages of Surgical Anesthesia.
J. G. Poe, M.D., Dallas, Texas.
Oxygen Supply and Demand in General Anesthesia.
R. C. Whitehead, M.D., Norfolk, Va.
Further Studies of the Blood Before and After Anesthesia.
Mary Gage Day, M.D., Kingston, N. Y.
Minor Pulmonary Embolism as a Postoperative Complication in Gynecology.
L. R. Wharton, M.D., and J. W. Pierson, M.D., Baltimore.
Further Studies in Iso-agglutinins Before and After Ether Anesthesia.
M. Huck, M.D., Baltimore.
General and Local Anesthesia in Face and Jaw Surgery.
L. Miller, D.D.S.
Subject to be announced.
H. W. Kearney, M.D., Washington, D. C.
Laboratory Experiments With Ethylene Dichloride.
Cline N. Chipman, M.D., and A. W. Hunter, M.D., Washington, D. C.

Anesthesia clinics will be held during the meeting in a group of Washington hospitals under the direction of the local anesthetists, and visiting anesthetists will be invited to demonstrate routine and newer methods of anesthesia. It is also expected that a number of pertinent laboratory demonstrations will be shown in the laboratories of Georgetown University.

The Southern Association of Anesthetists is anxious to have all members of the medical and dental professions in the South, interested in anesthesia, on its roster, and you are cordially invited to attend this Second Annual Meeting and also to bring it to the attention of all others who may be interested in attending.

For further information, address
Wm. Hamilton Long, M.D., Sec'y-Treas.,
1911 Duker Ave., Louisville, Ky.

Quarterly Index

ACIDOSIS, ACID-ALKALI EQUILIBRIUM AND. Desgrez and Bierry. Paris Medical, March 31, 1923.

ACIDOSIS OF FASTING AND DIABETIC ACIDOSIS, ESSENTIAL DIFFERENCE BETWEEN. Labbe. Bulletin de l'Academie de Medicine, February 20, 1923.

ACIDOSIS, THE MODERN CONCEPTION OF. J. S. Weingart, Des Moines. Iowa. Illinois Medical Journal. June. 1923.

ANALGESIA, SYNERGISTIC. Frank D. Smythe, Memphis, Tenn. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ANESTHESIA, GENERAL, LECITHIN IN RELATION TO. K. Tittle. Deutsche medizinische Wochenschrift, May 4, 1923.

ANESTHESIA, GENERAL, METHODS OF TEACHING TO DENTAL STUDENTS. E. W. Martindale, Columbus, O. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ANESTHESIA, POST-GRADUATE TEACHING IN, FOR DENTAL STUDENTS. H. I. Dorr and Theodore D. Casto, Philadelphia. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ANESTHESIA, GENERAL, IN RELATION TO DENTAL SURGERY. B. Weinbren. Medical Journal of South Africa, May, 1923.

ANESTHESIA. GENERAL PRINCIPLES OF. Fessler. Deutsche medizinische Wochenschrift, March 16, 1923.

ANESTHESIA WITH DICHLORMETHANE IN GYNECOLOGY AND OBSTETRICS. T. Schumacher. .Klinische Wochenschrift, March 19, 1923.

ANESTHESIA AND ANESTHETICS. C. H. Bastin, Vancouver. Canadian Medical Association Journal, May, 1923.

ANESTHETIC AND SURGICAL PROBLEMS IN ALVEOLECTOMY. F. F. Molt, Chicago. Current Researches in Anesthesia and Analgesia, June, 1923.

ANESTHETICS, LARYNGEAL INTUBATION IN. S. Rowbotham. British Medical Journal, June 30, 1923.

ANESTHETICS, NEW. C. Langton Hewer, London. British Journal of Anesthesia, July, 1923.

ANESTHETICS, USE OF. E. Baumann. Zentralblatt für Chirurgie, May 19, 1923.

ANESTHETIST'S POINT OF VIEW. Wm. Webster, Winnipeg. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ANESTHETISTS, THE PROFESSIONAL, PROBLEM OF SERVICE IN THE RELATIONS OF, TO THE SURGEONS. Ansel M. Caine, New Orleans. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ANESTHETIST, THE PHYSICIAN AS. M. W. Curran, Chatsworth, N. J. American Physician, June, 1923.

BLOOD CHANGES, SOME CHEMICAL, IN CHRONIC ALCOHOLISM. F. R. Nuzum, Santa Barbara, Calif. Journal American Medical Association, August 11, 1923.

BLOOD PRESSURE DURING OPERATIONS. E. Koenig. Deutsche Zeitschrift für Chirurgie, March 30, 1923.

BLOOD PRESSURE—AUTOMATIC AND REFLEX FACTORS IN THE MAINTENANCE OF BLOOD PRESSURE. Editorial. Journal American Medical Association, July 28, 1923.

BLOOD PRESSURE OBSERVATIONS, SOME ORIGINAL. Virgil C. Kinney, Wellsville, N. Y. Journal American Medical Association, June 16, 1923.

BLOOD PRESSURE IN ACUTE NEPHRITIS, EFFECT OF MAGNESIUM SULPHATE ON. Kenneth D. Blackfan, Cincinnati. Journal American Medical Association, July 28, 1923.

BLOOD, THE REACTION OF IN REFERENCE TO THE REGULATION OF RESPIRATION AND THE INFLUENCE OF ANESTHESIA THEREON. A. W. Downs, Edmonton, Canada. Current Researches in Anesthesia and Analgesia, June, 1923.

BLOOD GASES AND RESPIRATION IN DISEASE, EXAMINATION OF WITH REFERENCE TO CAUSE OF BREATHLESSNESS AND CYANOSIS. J. M. Campbell, J. H. Hunt and E. P. Poulton. Journal of Pathology and Bacteriology, Edinburg, April, 1923.

DEATH, CAUSE OF IN ELECTRIC SHOCK. Archives of Radiology, London, March, 1923.

DEATH FOLLOWING OPERATION FOR REMOVAL OF TONSILS. F. W. Bailey, Cedar Rapids, Iowa. Laryngoscope, May, 1923.

DEATH, UNEXPECTED, ESPECIALLY IN CHILDREN, WITH COMMENTS ON STATUS LYMPHATICUS. E. Glynn and R. C. Dun. Lancet, June 30, 1923.

ETHER ANESTHESIA, LIGHT. A. L. Flemming, Bristol Medico-Chirurgical Journal, March, 1923.

ETHER, COTTON PROCESS, SCOPE AND UTILITY OF. C. C. McLean, Dayton, O. Current Researches in Anesthesia and Analgesia, June, 1923.

ETHER, OPEN, FOR THE OCCASIONAL ANESTHETIST. A. Waters. Lancet, April 28, 1923.

ETHER ANESTHESIA, PROPER DEPTH OF. F. R. Widdowson, Philadelphia. Atlantic Medical Journal, April, 1923.

ETHER ANESTHESIA, THE VALUE OF PRESSURE AND CONTROLLED REBREATHING IN. J. J. Vega, Dayton, O. American Journal of Surgery, Anesthesia Supplement, July, 1923.

ETHER, ANESTHETIC, THE STANDARDIZATION OF, TOGETHER WITH THE ANALYSIS FOR AND INFLUENCE OF IMPURITIES. Allan Winter Rowe, Boston. Current Researches in Anesthesia and Analgesia, June, 1923.

ETHER THERAPY IN ACUTE PURULENT PERITONITIS. V. Caccini. Policlinico, April 30, and May 7, 1923.

ETHER THERAPY IN PNEUMONIA AND BRONCHITIS IN CHILDREN. F. L. Presti-Seminerio. Pediatria, February 15, 1923.

ETHER THERAPY IN WHOOPING COUGH. J. Bedo. Zeitschrift für Kinderheilkunde, June 7, 1923.

ETHER-OXYGEN EXPLOSIONS: THREE CASE REPORTS. Arthur E. Guedel, Indianapolis, Ind. Current Researches in Anesthesia and Analgesia, August, 1923.

ETHYL ANESTHETIC, A NEW. A. Lecerf. Presse Medicale, May 30, 1923.

ETHYL CHLORID-ALCOHOL GENERAL ANESTHESIA. Rene Reding, Brussels. Archives de Chirurgie Franco-Belges, March, 1923.

ETHYL CHLORID IN THE TREATMENT OF MYIASIS. Antonio Pedro. Brazil-Medico, Rio de Janerio, April 7, 1923.

ETHYL CHLORID AS AN ANESTHETIC FOR MINOR OPERATIONS IN CHILDREN. S. F. Rose. Lancet, June 16, 1923.

ETHYLENE AS A GENERAL ANESTHETIC, PRELIMINARY REPORT ON EXPERIMENTS WITH. W. Easson Brown, Toronto. Current Researches in Anesthesia and Analgesia, June, 1923.

ETHYLENE, WHAT IS NOW KNOWN CONCERNING. A. E. Guedel. Indianapolis Medical Journal, July, 1923.

ETHYLENE AND ACETYLENE AS ANESTHETICS. Chas. N. Jordan, Manhattan, Kansas. Journal American Medical Association, June 9, 1923.

HISTORICAL—EARLY ANESTHESIA. Sir D'Arcy Power, London. British Journal of Anesthesia, July, 1923.

LOCAL ANESTHESIA. O. D. King. U. S. Naval Medical Bulletin, June, 1923.

LOCAL ANESTHESIA, BLOOD PRESSURE DURING. Wiemann. Deutsche Zeitschrift für Chirurgie, March 30, 1923.

LOCAL ANESTHESIA—NOVOCAIN DERMATITIS. J. V. Klander, Philadelphia. La Odontologia, May, 1923.

LOCAL ANESTHESIA—RELATIVE TOXICITY OF SOME RECENT LOCAL ANESTHETICS. H. E. Tompkins, New York City. Dental Items of Interest, July, 1923.

LOCAL ANESTHESIA—COCAIN POISONING, A STUDY OF THE ACTION OF CALCIUM IN EXPERIMENTAL. Ira Frank, J. F. Strauss and W. A. Smiley, Chicago. Journal American Medical Association, June 30, 1923.

LOCAL ANESTHESIA, SURGICAL STRATEGY AS AN ADJUNCT TO, IN ABDOMINAL SURGERY. R. E. Farr, Minneapolis, American Journal of Obstetrics and Gynecology, July, 1923.

LOCAL ANESTHESIA, SOME OF THE FACTORS UPON WHICH THE SUCCESSFUL USE DEPENDS. R. E. Farr, Minneapolis. Illinois Medical Journal, July, 1923.

LOCAL ANESTHESIA—BLOCKING NERVE TO UPPER JAW. J. U. Carrea. Semana Medica, April 19, 1923.

LOCAL ANESTHESIA—NERVE BLOCKING FOR LOCKJAW. Vincent and Bernard. Bulletins de la Societee Medicale des Hopitaux, February, 16, 1923.

LOCAL ANESTHESIA—INTRAMUSCULAR INJECTION OF ALCOHOL FOR RECURRENT LUXATION OF THE JAW. Sicard Bulletin de l'Academie de Medicine, February 20, 1923.

LOCAL ANESTHESIA—BLOCKING THE PHRENIC NERVE IN INJURY OF THE DIAPHRAGM. Baron. Zentralblatt für Chirurgie, March 17, 1923.

LOCAL ANESTHESIA FOR HERNIA. B. F. Stevens, El Paso. Southwestern Medicine, June, 1923.

LOCAL ANESTHESIA IN HERNIOTOMY. O. Bloch, Louisville. Kentucky Medical Journal, April, 1923.

LOCAL ANESTHESIA, INFLUENCE OF ON MORTALITY RATE OF LARYNGECTOMY. J. Adams. Glasgow Medical Journal, April, 1923.

LOCAL ANESTHESIA—BLOCKING THE SPLANCHNIC NERVES. E. Metge. Deutsche Zeitschrift für Chirurgie, March 20, 1923.

LOCAL ANESTHESIA — SPLANCHNIC ANESTHESIA. E. Kutcha - Lissberg. Wiener klinische Wochenschrift. March 22, 1923.

LOCAL ANESTHESIA — BLOOD PRESSURE AND PULSE IN SPLANCHNIC ANESTHESIA. T. Schmidt. Medizinische Klinik, April 8, 1923.

LOCAL ANESTHESIA—A NEW AND MORE ACCURATE TECHNIC FOR INJECTING THE SUPERIOR MAXILLARY DIVISION. S. L. Silverman, Atlanta, Ga. Journal American Medical Association, July 14, 1923.

LOCAL ANESTHESIA, KULENKAMPFF'S, IN STRUMECTOMIES. Schnug. Münchener medizinische Wochenschrift, April 20, 1923.

LOCAL ANESTHESIA—TREATMENT OF TRIGEMINAL NEURALGIA WITH INJECTIONS OF ALCOHOL. Kulenkampff. Zentralblatt für Chirurgie, January 13, 1923.

LOCAL ANESTHESIA, THYROIDECTOMY UNDER. C. W. Allen. New Orleans. Southern Medical Journal, May, 1923.

LOCAL ANESTHESIA—SACRAL OR EPIDURAL ANALGESIA. J. Blomfield, London. British Journal of Anesthesia, July, 1923.

LOCAL ANESTHESIA—SACRAL ANESTHESIA IN OBSTETRICS. S. P. Oldham, Owensboro. Kentucky Medical Journal, July, 1923.

LOCAL ANESTHESIA—INTRASPINAL ANESTHESIA. P. Guibal. Presse Medicale, July 4, 1923.

LOCAL ANESTHESIA—INTRASPINAL ANESTHESIA. L. Razetti. Gaceta Medica de Caracas, January 15, 1923.

LOCAL ANESTHESIA—DRAWBACKS TO SPINAL ANESTHESIA. Desplas. Presse Medicale, May 23, 1923.

METHYLENE CHLORID IN ANESTHESIA. Wesley Bourne and R. L. Stehle, Montreal. Canadian Medical Association Journal, June, 1923.

NITROUS OXID-OXYGEN FOR INTRAORAL OPERATION, CONTINUOUS ANESTHESIA WITH. John B. Dillon, Boston. Current Researches in Anesthesia and Analgesia, August, 1923.

NITROUS OXID-OXYGEN ANESTHESIA—OBSTETRICAL FABLES IN GAS WITH REPORTS OF 100 CASES. J. B. Maple, Sullivan, Ind. Current Researches in Anesthesia and Analgesia, August, 1923.

NITROUS OXID-OXYGEN ANESTHESIA IN SURGERY. M. Chifoliau. Le Progres Medicale, May 12, 1923.

OXYGEN THERAPY. Lian and Navarre. Bulletin de la Societee Medicale des Hopitaux, March 23, 1923.

PAINLESS CHILDBIRTH BY SYNERGISTIC METHODS. E. P. Donovan and James T. Gwathmey, New York City. British Journal of Anesthesia, July, 1923.

PAINLESS LABOR. R. L. Raiford, Sedley, Va. Virginia Medical Monthly, June, 1923.

PREOPERATIVE COMPLICATIONS — TREATMENT BEFORE AND AFTER OPERATIONS. P. Gilberti. Policlinico, March 12, 1923.

PREOPERATIVE EXAMINATION. F. F. Gundrum and J. B. Harris, Sacramento. California State Journal of Medicine, March, 1923.

PREOPERATIVE COMPLICATIONS—THE PRELIMINARY EXAMINATION OF PATIENTS WHO ARE TO UNDERGO SURGICAL OPERATION. A. H. Miller, Providence, R. I. Current Researches in Anesthesia and Analgesia, August, 1923.

PREOPERATIVE COMPLICATIONS—CARDIAC DISORDERS ACCOMPANYING EXOPHTHALMIC GOITER. E. P. Boas, New York City. Journal American Medical Association, June 9, 1923.

PREOPERATIVE COMPLICATIONS—THE DISABLED HEART AND GENERAL ANESTHESIA. M. Worth Brown, Toledo, O. Current Researches in Anesthesia and Analgesia, June, 1923.

PREOPERATIVE COMPLICATIONS — MYOCARDIAL DEFICIENCY FROM THE SURGICAL STANDPOINT. J. L. Yates, M. F. Rogers and R. E. Morter, Milwaukee. Wisconsin Medical Journal, April, 1923.

PREOPERATIVE COMPLICATIONS—ANESTHESIA IN PROSTATICS. E. A. Tyler, Philadelphia. Current Researches in Anesthesia and Analgesia, June, 1923.

PREOPERATIVE COMPLICATIONS—TWO STAGE RESECTION IN GASTRIC CANCER. Ziegner. Zentralblatt für Chirurgie, April 7, 1923.

PREOPERATIVE COMPLICATIONS — THYROIDISM COMPLICATED BY HEART FAILURE. Burton E. Hamilton, Boston. Journal American Medical Association, June 16, 1923.

POSTOPERATIVE COMPLICATIONS—EFFECT OF SODIUM CHLORID ON BLOOD IN INTESTINAL OBSTRUCTION. R. L. Haden and T. G. Orr, Kansas City. Kansas Journal of Experimental Medicine, July, 1923.

POSTOPERATIVE COMPLICATIONS — ACUTE INTESTINAL OBSTRUCTION WITH SPECIAL REFERENCE TO PARALYTIC ILEUS FOLLOWING ABDOMINAL OPERATION. Hugh McKenna, Chicago. Journal American Medical Association, June 9, 1923.

POSTOPERATIVE COMPLICATIONS — KETOSIS, ACIDOSIS AND COMA TREATED BY INSULIN. W. R. Campbell, Toronto. Journal Metabolic Research, November-December, 1922.

POSTOPERATIVE COMPLICATIONS — INSULIN TREATMENT OF POSTOPERATIVE NONDIABETIC ACIDOSIS. Wm. Thalhimer, Milwaukee. Journal American Medical Association, August, 4, 1923.

POSTOPERATIVE COMPLICATIONS—EFFECTS OF HEAT ON OPERATIONS FOR EXOPHTHALMIC GOITER. A. J. Walton. British Medical Journal, June 23, 1923.

POSTOPERATIVE COMPLICATIONS—ABSCESS OF THE LUNG. J. J. Singer and Evarts A. Graham, St. Louis. Journal American Medical Association, July 21, 1923.

POSTOPERATIVE COMPLICATIONS — PULMONARY EMBOLISM. J. L. Caline, Wellington. Journal Kansas Medical Society, July, 1923.

POSTOPERATIVE COMPLICATIONS—REMARKS ON BRONCHO-PULMONARY COMPLICATIONS FOLLOWING OPERATIONS UNDER ANESTHESIA. W. J. McCardie, Birmingham, England. British Journal of Anesthesia, July, 1923.

POSTOPERATIVE COMPLICATIONS—POST-TONSILLECTOMY PULMONARY ABSCESS. Mary E. Botsford, San Francisco. Current Researches in Anesthesia and Analgesia, August, 1923.

RESPIRATORY EXCHANGE AT HIGH ALTITUDES. E. C. Schneider, Long Island, N. Y. American Journal of Physiology, June, 1923.

RESUSCITATION IN ABDOMINAL SURGERY. W. Wayne Babcock, Philadelphia. American Journal of Obstetrics and Gynecology, August, 1923.

RESUSCITATION — EPINEPHRIN IN THE REVIVAL OF THE HEART. Editorial. Journal American Medical Association, June 23, 1923.

RESUSCITATION OF THE HEART BY INTRACARDIAC INJECTION OF EPINEPHRIN. Hartung. Beitrage zur klinischen Chirurgie, Vol. 129, November, 1923.

RESUSCITATION—INTRACARDIAC INJECTION OF EPINEPHRIN. E. Baumann. Schweizerische medizinische Wochenschrift, February 22, 1923.

RESUSCITATION—INTRACARDIAC INJECTION OF EPINEPHRIN. Paul B. Champlin, St. Louis. Journal American Medical Association, July 21, 1923.

RESUSCITATION—MASK FOR INHALATION OF OXYGEN AS AID IN ARTIFICIAL RESPIRATION. M. Nicloux and R. Legendre. Bulletin de l'Academie de Medicine, February 20, 1923.

SHOCK, THE AUTONOMIC NERVOUS SYSTEM IN. Howard D. McIntyre. Cincinnati. Current Researches in Anesthesia and Analgesia, August, 1923.

SHOCK, POSTOPERATIVE. Misrachi. Presse Medicale, June 23, 1923.

SHOCK, PROGNOSIS OF TRAUMATIC. G. Jeanneney, Bordeaux. Paris Medical, February 10, 1923.

SHOCK PROPHYLAXIS. Charles J. Wells, Syracuse, N. Y. American Journal of Surgery, Anesthesia Supplement, July, 1923.

SURGICAL PATIENT, THE WELFARE OF. A. J. Slater, Winnipeg. Current Researches in Anesthesia and Analgesia, June, 1923.

THORACIC SURGERY, RECENT PHASES OF. Evarts A. Graham, St. Louis. Journal American Medical Association, June 23, 1923.